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VOL. XVIII NO. 11

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Scientific Management in Comptrollership . . .

Facts About Human Engineering . . .

Statistical Techniques in Industry . . .

How to Lower Toolroom Costs . . .

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The Big Management Problem — Reducing Costs

DURING the next few years many more companies will try to cut costs than will succeed. They will fail to cope successfully with management problems in contrast to the technical engineering ones. In other words, they will have less trouble finding out how to make a good time study or get a machine layout changed, than they will in dealing with the policy and organizational questions. Why?

First, it takes time to establish cost consciousness in the executive organization. It cannot be done overnight. Cost consciousness in the executive organization is a precious attitude that management cannot turn on and off at will. Once it deteriorates, as it has in many companies since the beginning of World War II, it is very hard to build up again.

Second, a company must have the basic concepts of organization established if cost consciousness is to be attained.

While there is nothing new about the basic organizational questions which management faces in reducing costs, the experience of recent years provides us with some new lessons and insights about how to handle them.

Costs are every management man's job. But it has now become quite clear that in a company of any size, some man or department with high authority should be made responsible for the reduction of costs and little else. In a large company, the need may be for a well-staffed department; in a company with 100 to 200 people, one strong man may be enough.

The job is to spark the efforts of line supervisors in actually engineering lower costs. Here we need action in the shop itself; the problems involved are those of industrial engineering.

The company that tries to get along nowadays without an industrial engineer, or that has one and ignores him, is almost certainly losing a very substantial amount of money every year for that very reason alone. This is to say nothing of management-union relationships, always influenced by the good work, or lack of it, of an industrial engineer.

The Industrial Engineering Division of SAM recognizes the importance of this modern organizational concept—to industry, commerce, and government. It is just as important to low cost distribution and the office function as it is to manufacturing. This SAM Division is advisory to SAM's Fall and Spring Conferences and to the 58 Chapters in the planning of stimulating programs, and operates for the further growth and development of members responsible for lower costs.

Management men must work out the organizational problems in cost reduction first—the technical steps are not so difficult and certainly take less time.

And the parallel between business itself and cost reduction must never be allowed to escape.

Cost reduction is not a one-shot proposition. It is a continuing, fluctuating process. The moment management relaxes and lets costs alone, costs start getting out of line. Conditions in American business—on the plant floor, in the market and among competitors—are always changing. They never remain static. Neither do costs.

BRUCE PAYNE, President, SAM

Applying Sound Management Principles To Comptrollership in Large Organizations

by Lt. Gen. Raymond S. McLain, USA

Every man in the management field can appreciate the difficulties entailed in making the control of a large organization work. In this article the author, a former comptroller of the United States Army, tells how the system of control worked there, and shows how its setup and operation can be applied to every modern industry and business

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With the conclusion of World War II and of the rapid demobilization which followed, the Army had an opportunity to look at its organization and procedures in the light of its wartime experience, but without the stress which that experience had placed upon it. Out of the organizations and procedures which were developed to meet emergency situations, some should be continued, some should be discarded. Many of the peace-time procedures had proven ineffective in war. The Army had to determine the pattern of organization and management practices which would be best for it in the years to come.

While the Army is not in business for profit and cannot always follow each principle or practice beneficial to a business enterprise, it is apparent that basic principles of sound management apply in all forms of successful endeavor if a mission is to be accomplished effectively, efficiently and economically. A postwar problem of the Army, therefore, was the question: "How can the Army be improved through the adoption of modern business techniques in order to achieve greater economy, a better product, or better control and understanding?"

The Army moved to meet the problem with the objective of giving the nation the most security the taxpayer's dollar could buy in its field of responsibility. As a first step, a management group was established to search for practical solutions to the problem of integrating the varied activities of such a complex organization. One of the recommendations of this group proposed the establishment of an Army Comptroller to develop sound organization, management, and accounting practices in the Army.

The position of Army Comptroller was established on January 2, 1948. Shortly thereafter, a civilian management group was employed to examine organization and procedures. Having given itself a preliminary examination, the Secretary of the Army wanted the benefit of outside consultation. Results of the survey were in turn re-examined by the Army Comptroller's Management Division to assure that military considerations were not overlooked in the development of the mechanics for management improvement. It is as fallacious to expect a business man to achieve a balanced product by applying his business knowledge to the problem of producing and running an Army in peacetime, as it is to expect the professional military mind to keep up with the most up-to-date business methods and techniques. The result is usually arbitrary orders, or arbitrary budget cuts, on the general presumption that all budgets are inflated and therefore arbitrary cuts will produce orderly and more realistic adjustments.

Army Begins Comptroller Programs, Idea Spreads

At this time the Army Comptroller was not a statutory office. He was designated by the Secretary of the Army under the Secretary's responsibility and authority to provide for the efficient conduct of the Department, and from the very beginning he was charged with the duties of Budget Officer, Fiscal Officer, and Management Engineer of the Army. Some 19 months after the Secretary of the Army and the Chief of Staff had started this modest comptroller program, Congress passed a law (P.L. 216) providing Comptrollers for the Department of Defense and for the Army, Navy, and Air Force.

The Comptroller of the Army, as he is now called under law, is directly responsible to the Secretary of the Army, just as the other military Comptrollers are responsible to their respective Secretaries. These Comptrollers work in harmony; they are consistent with each

other; they follow policies consistent with those of the General Accounting Office and the Bureau of the Budget in their respective fields. Under a wise provision of the law, at the direction of the Secretary, the Comptroller of the Army is also concurrently responsible to the Chief of Staff. This ties the military and civilian interest together and makes the Comptroller a part of the team. The Comptroller is therefore a staff officer of the responsible executive, and not a law unto himself; and there is no chain of responsibility from the Comptroller in one echelon to another. The Commander is solely responsible for the product and he alone must tie his responsibility to the means, and answer for the results. To have one man responsible for the results, and another with a string on him which he could snatch at will, would be stupid. The Comptroller keeps the means and the final product clearly focused and it can be clearly seen by the responsible person and all those above him.

Comptroller Plays Vital Role in Management

As would normally be expected, the Comptroller of the Army has direct supervision over matters of money, budgeting, accounting and audit. In addition, he is responsible for progress and statistical reporting and for management engineering in the Army. With these functions, he plays a vital role in the management of the affairs of the Army.

Management of any activity has three aspects: planning, execution, and review. These three aspects comprise program management. The Army has adopted a conventional system of programming its activities, a program being defined as a scheme of administrative action designed for the accomplishment of a definite objective. Fourteen primary programs were established. Each of the three aspects of program management is supervised by a Deputy Chief of Staff. The Deputy for Plans and Research designs and develops the plans. The Deputy for Operations and Administration puts the machinery of the Army in motion to carry them out. This machinery is the Special Staff, the Administrative and Technical Staffs and Services, the Continental Armies and overseas garrisons, and various other activities. The Comptroller of the Army, who ranks as a Deputy, reviews the results of program execution, analyzes them, and lays them before the other Deputies and the Vice Chief and Chief of Staff and the Secretary of the Army and his assistants.

The Comptroller of the Army is its chief examiner. This does not mean that he is the only one, of course. His staff not only analyzes data; it organizes analyzed data for examination by others. There are also Comptrollers in the major commands who at their levels have functions similar to those of the Comptroller of the Army. Thus, from top to bottom, the activities of the Army are under continuous review in an appraisal of the effectiveness of program execution.

The Program Review and Analysis Division of the Office of the Comptroller of the Army is the organization which subjects the fourteen primary programs to constant review and which reports the progress under each program and their relation to each other. The data used by this division in turn come from other staffs and operating elements. This system of data accumulation and analysis takes statistics and puts them on paper or on charts. It makes them speak loudly of how programs are developing—whether they are lagging or over-extending themselves. The figures produced are working figures, not statistics which are given a "morgue" status to be exhumed when the notion strikes.

Another organization in the Office of the Comptroller of the Army with a review function is the Audit Division. While the organization itself was in being when the position of Comptroller was established in the Army, a new concept called "Internal Audit" has been introduced in the functions of the Audit Division. An internal audit is an independent appraisal of accounting and financial operations and directly related policies, organization, procedures, and personnel as a basis for protective and advisory service to all levels of management. It evaluates the adequacy and effectiveness of other internal controls. Overall audit problems are too extensive to permit complete item checks and the new technique of internal audit greatly simplifies the problem. Army audits are coordinated with the General Accounting Office to avoid duplication where possible.

One of the Improvements In Guiding Over-All Management

One of the greatest improvements in the way of guiding over-all management has been the emphasis placed on management engineering as a specialty. The Management Division of the Office of the Comptroller conducts surveys of methods, systems, procedures, and administrative organization, assists other commands in management improvement, and coordinates the exchange of pertinent information among commands.

The Program Review and Analysis Division examines the primary programs. The Audit Division looks at financial matters and appraises control procedures. The Management Division evaluates and seeks to improve the every-day structure, tools, and techniques of a going enterprise. Of particular interest to the taxpayer is the undertaking of management surveys by this Division.

Team Cooperation is the Key To Efficiency

It isn't difficult to see that an operator needs staff assistance in the form of independent appraisal and expert assistance in management improvement. When a Chief of a Technical Service, such as Ordnance or Quartermaster, or Chemical, is appointed, his principal interest is in turning out a military product and in seeing how the product performs in the field in connection with the troops who will employ it. His whole training has been toward this purpose. His greatest concern is to this end. While he is a good manager, circumstances often deny him the opportunity to do more than take the existing machine and turn out the product he desires to the best of that machine's ability. To improve that machine he needs expert assistance as his operation is too large and too complex for part-time or amateur examination. An expert in organization and procedure can tell the Chief of a Service whether his organization and methods are antiquated or doing a good job. With this assurance, the manager can rapidly make changes in his organization and procedure.

Therefore a survey team is organized to examine an organization for the purpose of finding a means of saving money, of doing a better job, or of obtaining better control. These efforts, focused into management, enable managers at all levels of authority to make better administrative decisions, from the individual installation surveyed through the office of the responsible Chief of Service, into the General Staff agency doing the planning, and into the top executive offices of the Army. These management surveys are profound examples of self-examination.

A management survey, performed under the direction of the Comptroller of the Army, is not an autocratic, unilateral appraisal of management by a detached group. It is a cooperative effort organized by the Comptroller who furnishes technical knowledge, largely from top civilians of various business experiences. This is coupled with the General Staff office having jurisdiction over the subject, together with representatives from the Chief of the Technical Service concerned. This group is a team in fact, representing the reviewer, the supervisor, and the operator. Examinations are made in such a way that not only the technical aspect but the service aspect are thrown together and weighed in an integrated examination. This eliminates bias from either the business standpoint or the service standpoint. When a finding is made, all angles have been examined, deliverately evaluated, and related to all other aspects of the service in which the survey is being made. A survey of this nature is not a "crash" project which comes up with a single finding unrelated to other problems. Spectacular claims and publicity are avoided as prejudicial to full cooperation in applying remedies. The findings thus arrived at are understandable by the agency that must put them into effect. No matter how valid a finding may be, it will never have a chance unless it has the sympathetic approval of those who must put it into effect.

Survey is Only The Beginning

It can be seen that a thorough management survey will produce hundreds of findings which could be isolated and made the subject of criticism. A business-like job demands that corrections be made quickly and without publicity. The Army has corrected many deficiencies through the management survey machinery as soon as recommendations for change were determined to be sound or as fast as the means for correction became available. When management surveys are completed, the job is not done, however. While a one-time examination would produce certain benefits, recheck and reexamination are required to keep pace with changing conditions and consultative assistance in business management must always be available to the operator if management improvement is to be continuous rather than sporadic.

The first such survey was made of the Corps of Engineers. The survey group studied Corps of Engineers' activities at Headquarters and at typical installations all over the United States. The report of the survey contained recommendations relating to 201 different actions. All but 37 of the 201 findings were accepted by the Chief of Engineers. Some were agreed to with exceptions; on others there was an honest difference of opinion. By the time the final report reached the Secretary of the Army, over 50 of the recommendations had been acted upon by the Chief of Engineers. Some recommendations required decision by the Chief of Staff and the Secretary of the Army. Additional legislation will be necessary to implement some recommendations. Implementing actions are continuing under the guidance of the Comptroller of the Army. The Comptroller cannot enforce these recommendations. The examination completed, implementation is a matter of command decision at varying levels of authority.

Various Accomplishments of Management Survey

Among the substantial accomplishments of the Management survey of the Corps of Engineers have been a simplification and improvement of administrative organization; strengthening of planning for military construction, improvements in maintenance and real estate management; simplification of supply and procurement procedures, and improvements in financial and general management. Even before the outbreak of hostilities in Korea, the Office of the Chief of Engineers reported that the actions already taken on survey recommendations had resulted in economies of between two and three million dollars annually. Far more important in time of emergency are improvements in end-result effectiveness which are also the objectives of the Army's management audits.

A management survey of the Chemical Corps was completed with 279 recommendations, all but six of which were concurred in by the Chief Chemical Officer. Among the actions already taken as a result of this survey is the creation of a simplified field organization based upon a high degree of decentralization.

The Comptroller of the Army, as has been pointed out, is but one examiner in a whole system which promotes self-examination. Program review and analysis, audit, and management surveys of one kind or another are constantly in progress at all levels of command. The Army has many economies to its credit in all types of activities. A depot consolidation in Alaska resulted in a direct saving of $400,000. Post reorganization in Hawaii made possible the elimination of personnel whose combined salaries amounted to more than $15,000,000 a year. Rebuild of equipment left over from World War II returned to the supply line 9½ billion dollars worth of material for an expenditure of 1½ billion dollars.

Self-Examination has Vast Potential

Measuring improvement in terms of dollar savings is not difficult; what is hard to describe is increased effectiveness, better control, improved efficiency, and better understanding. These improvements are disclosed in mission performance and in the attainment of objectives on which no monetary value can be set. Tactical units do not have Comptrollers but their commanders recognize the need for sound management and are part of the management team. With their cooperative effort, balance is achieved in the application of money and materials.

Self-examination in the Army has produced encouraging results. A spirit of cooperative enterprise has been engendered. A cost-consciousness now pervades the Army Establishment from the Secretary of the Army through the last man in the line. In garrisons around the world, individuals are examining activities within the scope of their responsibilities. A major commander makes a decision which saves a million dollars. An individual soldier or civilian employee makes a suggestion concerning his own job which results in a savings or in a better performance. They all add up to a more effective Army at less cost for the job to be done. The potentialities of self-examination are as extensive as the Army budget and the Army mission. Much as been done; much remains to be done. From the beginning, self-examination to produce better management showed this; management can be improved and the results are worth the effort.

The secret of Comptrollership is obtaining experts in the field under examination—then the complete collaboration and cooperation by personnel from the activity under examination. This latter personnel must not be a perfunctory person or persons, but men who will have a large part in carrying out the findings of these examinations after they are made. **END**

Management's Responsibility For The Use Of Statistical Techniques In Industry

by W. Edwards Deming

Statistical administration is a new and growing management profession, says this author. In this definitive article he gives a short history of the growth and development of statistical techniques for quality control, tells of the impact such techniques have had on industry since 1940, shows that the statistical method is actually a way of management thinking, and describes how statistical control of quality can help a company's production efficiency by affecting the product from raw material purchase to the final customer

THE use of statistical techniques in industry, under competent guidance, results in greater output, plus the competitive advantage of better quality, more uniformity, less waste, and greater dependability of product. Amazingly, these achievements usually take place simultaneously with reduced cost of production, and without expansion of plant. So statistical techniques are now an important tool of production and distribution. For still more effective use of these techniques, top management should not only become familiar with the results of statistical methods; they should study also the problems of organization by which to achieve a wider and more effective use of these methods.

Statistical knowledge can contribute vitally toward the maintenance of private enterprise, which must depend more and more on the continual improvement of the efficiency and the effectiveness of production and of distribution, and on the continual improvement of the design of product in respect to both quality and uniformity, to meet the changing needs and the demands of the consumer wherever he may be.

By industry we must include practically every kind of production or service. A public utility company is included, a hotel, a restaurant, a laundry. Even a university is included: it takes in raw material, processes and inspects it, and turns out a product.

Statistical Control Applied in Practice Only Recently

It has been only 11 years since the statistical control of quality really started to expand in the United States and Canada. Even more recent starts have been made in other countries. The first step in any development is some necessary theory, and this had been created by Shewhart and by Dodge in papers and books, notable dates being 1926, 1931, 1934. However, little had actually been done in application. Even in the year 1941 it was very difficult to find actual examples of the use of control charts in American industry, although one could find applications in isolated spots. Acceptance sampling had gained a somewhat better foothold. Today the situation is entirely different; statistical quality control is everywhere, and it is difficult to believe that the widespread use of the control chart techniques, acceptance sampling, and industrial experimentation, which we see in every kind of industry far and wide, big and little, in America, fanned into flame only a few years ago.

Some simple, brief texts,[1] and 8-day intensive courses, initiated by Stanford University in July of 1942, were the real kindling material that brought the control charts and acceptance sampling into general use in a remarkably short period of time in America. Results were even more rapid in Japan with the same texts and method of teaching in Japan, begun systematically in 1950, with the same texts and the same system of tutelage. One reason: the intense interest of top management.

It should be added that in America the earlier statistical work of Simon (now Lt. Gen.) and his colleagues in the specification, manufacturing, and testing of ordnance materials beginning well before 1940 showed that statistical methods provided the only way for manufacturers to meet the increasingly severe

1. "Guide for quality control", "Control chart method of analyzing data", and "Control chart method of controlling quality during production", Z1.1,2,3—1942 (The American Standards Assn., 70 E. 45th St., New York 17).

goals of output and precision that ordnance required, in the face of shortages of critical materials.

A further factor was the provision for continuation study, following the 8-day courses. In almost every city in the country where an 8-day course had been held, a group of the men organized themselves for monthly discussions for further study, and it was these groups that formed nuclei for the condensation of the American Society for Quality Control in 1946. Continuation study in Japan is more thorough through the excellent facilities of the Union of Japanese Scientists and Engineers—in reality an institute for adult education, serving scientists and engineers in practice.

But the statistical method is more than just a body of techniques. It is not a collection of figures. It is a mode of thought—it provides more reliable answers and sharper decisions especially where competition is keen, where specifications and uniformity are difficult to meet, where the differences between the performances of materials and machines and processes are small, but where a wrong decision may cause heavy losses. Statistical problems must be solved with statistical knowledge; not with knowledge of engineering, production, economics, etc.

Statistical Techniques Needed Throughout Production

Let us take a look at any production line. It begins with the procurement of raw materials. Material must be received, tested, accepted, rejected, paid for, and sorted for use. The sampling and the tests of materials must make statistical sense, otherwise the buyer or the seller may be subjecting himself to systematic over- or under-payment. Much of the best work in a statistical control of quality has extended back to the plants of the sources of raw materials, in recognition of the fact that a certain amount of uniformity and dependability of raw materials is necessary if a manufacturer wishes to put out good quality himself. But he must define "good" and "uniform" statistically in terms of the demands of the consumer.

Next comes the production line with its various operations and assemblies, tests, and final inspections. Then the product starts for the market through various channels of distribution. Sometimes the consumer will be only another department of the same company across the corridor (sometimes the toughest of all customers to get along with). Sometimes the consumer will be another manufacturer; sometimes the consumer will be the great mass of people or of families of this nation and of other nations.

Statistical techniques are needed along the whole line of production, which stretches from raw material to consumer. It is recognized by astute manufacturers that gaps in statistical work, anywhere along the line, mean losses in production, losses in materials, comparative depreciation in quality and uniformity, excessive costs, and ultimate shrinkage of the market.

How Statistical Techniques Have Aided Business, Industry

The impact of statistical theory during the past 12 years has been so drastic that it has affected and altered practically every human activity in production, business, government, and research. Wherever statistical techniques have been applied with competence and conviction, the results have invariably been increased production and other advantages noted below. It is interesting to give a brief tabulation of a few common activities that have been hit by this statistical impact.

1. Production
   a. Increased output

      Increases of from 10 to 230% production have been reported in the literature. It is important to bear in mind that these increases take place without increased machinery or floor space

      How? Through more efficient use of materials and machines; improved quality; less scrap and re-work.

      A large pharmaceutical company reported that they were able to make a particular antibiotic with only 30% as much raw material as they had used six months earlier before they introduced control chart techniques. A large steel company reported the saving of one-third of their fuel over their performance the year before. Such results are not unusual: they are merely illustrative.
   b. Better quality at less cost
   c. Greater uniformity at less cost
   d. Improved competitive position through increased production, better quality, better uniformity, better design, reduced costs.
   e. A meaningful international language
      (1) by which to express standards and specifications of the quality desired
      (2) by which to describe the quality of a product already made.
2. Management
   a. Meaningful specifications (impossible without statistical techniques)

      For example, with respect to uniformity of quality, level of quality, rate of production, quality of performance
   b. Meaningful measure of the performance actually attained (impossible without statistical techniques)

      For example, with respect to uniformity of quality, level of quality, rate of production, quality of performance
   c. Improved knowledge of the capabilities of machines and of processes, with respect to uniformity, level, and production rate

      A mistake in accepting a huge contract that calls for greater speed or for greater uniformity of higher quality than a factory can produce economically may spell ruin. Statistical techniques provide the kind of information and the calculations that management must have for making rational decisions.
   d. Sampling and testing of materials

      Statistical techniques provide better knowledge of the weight, quality, and uniformity of a lot or of a series of lots of materials received, and of their chemical and physical characteristics.
   e. Knowledge of materials manufactured

      Statistical techniques provide reliable figures on the quality and uniformity of product, so that management can fill contracts for specific qualities with confidence, and with satisfaction to the consumer.
   f. Testing and comparison of processes and of materials

      Two processes or two materials are to be compared for rate and cost, and for uniformity and level of quality. Statistical techniques provide economical

tests and reliable inferences to help management make the right decision.

g. Measurement of costs and of production rates
Statistical observations give the only reliable information on costs and rates, and they provide simultaneously an effective tool by which to increase the efficiency of an operation.

h. Timely approximations on production, sales, shipments, sizes and activity of accounts, for management purposes

i. Most economical inventories for retail and for wholesale stocks, and for service

3. Consumer research (through modern statistical procedures, an essential adjunct to economic production; *vide infra*)

4. Auditing and accounting
   a. Verification and reconciliation of inventories and of accounting records, with improved reliability at less cost
   b. Auditing, with improved reliability at less cost
   c. Verification of bills payable, with improved reliability at less cost
   d. Current determination of unearned income (interline and intercompany payments; unused tickets; unused deposits)

5. Determination of physical condition of plant; estimates of repairs needed, by type of repair (telephone companies, railways, electric light service, gas service, etc.)

6. City planning: locations of Thoroughfares, fire departments, schools; treatment of blighted areas

7. Safety (more effective results through more effective administration of a safety program, made possible by statistical definition of significantly high and significantly low rates)

8. Insurance rates and service (better service through statistical estimates of risks and of frequencies)

9. Control of the quality of clerical operations (better and more accurate results at reduced cost)

10. Psychometrics

11. Chemical and physical measurements and experiments
    a. Statistical designs provide improved precision and greater accuracy at reduced cost

12. Mining (evaluating vein depth)

13. Standardization and specialization
    a. This is in large part a statistical problem. A standard and a specification should serve many needs; and needs can be determined only by reliable surveys, and by reliable tests on performance.
    b. Moreover, neither a standard nor a specification has any meaning unless it is written in terms of a test that can be brought into statistical control, and without too much expense or difficulty.

14. Standardization of drugs
    a. Statistical control of the potency of drugs and vitamins is necessary. Tests of potency must show statistical control if the dosage is to have meaning.

15. Statistical system (for industry and government)
    a. Through new theory and methods of sampling, coupled with better appreciation for the value of statistics by the business executive, we now have much greater use of statistics, less misuse, and much greater volume and variety of statistics to satisfy the demand through monthly or quarterly surveys. Several federal statistical agencies have not only contributed new theory and methods, during the past 15 years, but have introduced effective organization by which to put these methods into service. The result is reliability tailored to the need; speed; more information per unit cost; controllable precision; and information of known precision.

Definition of Statistical Quality Control

The statistical control of quality is the application of statistical principles and techniques in all stages of production, directed toward the most economic manufacture of a product that is maximally useful and has a market.

Let us see what this definition means. First of all, what is quality? Quality is meaningless except in terms of the consumer's demands. Hence, the first step in the statistical control of quality is to study the demands of the market. Unless a manufacturer sees the problem this way, he may find himself using excellent statistical techniques in production and inspection, only to make a beautiful product, very economically, for a market that he misjudges so badly that his company is in serious danger, or fails to realize possible service and profits.

Let us think of price. Price, like any fraction, has both a numerator and a denominator. Price has no meaning without reference to quality. Price is miles per gallon, or so many cents per extractable pound of usable material. The measurement of quality is a necessary part of quality control, and a necessary part of any statement of price. Moreover, quality must be expressible in language that both buyer and seller understand.

Statistical methods not only help to produce uniform and dependable quality, they provide also an international language in which to express quality and in which to conduct negotiations, even though buyer and seller be in different parts of the globe.

Consumer Research Involved in Production, Selling

Consumer research also is an integral part of production. With good consumer research, the product has a better chance of being maximally useful, and of being made in the most economical quantities.

Consumer research acts as a governor or servo-mechanism, which by probing into the reasons for the preferences and for the dislikes of both consumers and nonconsumers, yields predictions that assist management to make informed decisions with respect to changes that should be made now in design, quality, uniformity, and production levels, to meet most economically the demand for the product six months or a year later.

Consumer research is not merely selling, yet it is essential for selling. Real consumer research, geared to design and production, is an indispensable modern tool for the problems of the industrial age. Good consumer research, combined with other statistical techniques, can help to build a firm foundation for private enterprise.

Consumer research, finally, is communication between the manufacturer and the users and potential users of his product.

When the number of users and potential users is measured in the thousands or millions, this communication can be carried out reliably and economically only by modern statistical procedures. Methods of conducting surveys have changed radically during the past three years, owing to continual improvement of statistical procedures, particu-

larly in sampling, design of experiment (for product-testing), and in statistical definitions of the information required. Costs of consumer research have decreased in relation to the reliability and usefulness of the results.

Consumer research might be called democracy in industry, as it gives both the manufacturer and the consumer a voice in the design of the product.

How Consumer is Given Voice in Design of Product

Manufacturers used to think of manufacturing in three steps. Success depended on guess-work — guessing what type and design of product would sell, how much of it to make. In the old way, the three steps are completely independent: 1. Design it, 2. Make it, 3. Try to sell it.

In the new way, management introduces, through consumer research, a fourth step, and runs through the four steps in a cycle, over and over. 1. Design the product (with appropriate tests); 2. Make it; test it in the production line and in the laboratory; 3. Put it on the market; 4. Test it in service; through market research, find out what the user thinks of it, and why the non-user has not bought it; 5. Re-design the product, in the light of consumer reactions to quality and price.

This 4th step was impossible until recently. It could not be carried out economically or reliably. Intelligent manufacturers have always been interested in discovering the needs and the reactions of the user and of the potential user, but until recently they had no economical or reliable way of investigating them.

The 4th step, communication between the manufacturer and the user and the potential user, gives the public a chance. It gives the user a better product, better suited to his needs, and cheaper. Democracy in industry, one might say.

General Principles for Expanding Use of Statistical Techniques

Practically all of the uses of statistical techniques described so far are applicable in any one company. How many companies have made provision to expand the use of statistical techniques? How many they proceed to do so?

These are very important questions. In normal competition the expansion of statistical techniques would be absolutely vital to survival.

No particular organization chart will fit exactly everywhere, but it is possible to lay down some general principles that any organization chart must conform to.

First, if statistical techniques are good, then they should be used wherever they may be found useful, and not just where they happen to grow up. A company can not afford to do some excellent work with control charts in one part of the plant, while it permits the sampling and testing of materials, of machines, or of processes, or its consumer research, to sag into lower grade.

Second, statistical techniques must not be administratively subordinate to the testing of materials, to production, inspection, consumer research, design, or to anything else, yet they must serve all these functions. Statistical work can not be directed by someone who has no knowledge of statistical principles any more than research in thermodynamics could be directed by an accountant. The statistical administrator must enjoy a position like that of the comptroller, whose job is to report his findings for the good of the company.

New Ideas Must Be Given Opportunity to Develop

Third, the organization must be one in which new ideas have a chance to be heard, and to be developed. The non-statistician is not the one to evaluate, to encourage, or to discourage, a new statistical idea, however helpful he may be.

These thoughts run parallel to a principle laid down in the Hotelling report on the teaching of statistics, viz., that the teaching of statistics must not be subordinated to the Department of Economics, nor to the Department of Mathematics, nor to the Department of Education, nor to anything else. Statistical teaching and statistical work in government and in industry are full-time professional jobs of their own.

Fourth, the use of statistical methods is not mere "application." There can in fact be no application without theory to apply. There can be no knowledge without research, however humble. The purpose of research is to discover what we need to know in order to meet problems of the future.

The most valuable statistician is the one who knows the most theory, provided he is clever at adapting it and at explaining what he wishes to do with it.

Incidentally, statistical techniques are not installed. One sometimes hears of a company that is about to "install" the statistical control of quality, as if they were about to install a new air-conditioning system, or new linoleum, a new filing system, or even a new president. Statistical principles and techniques must be rooted and nourished with patience, support, and recognition from top management. They do not blossom out suddenly. They may even lead to a mistake now and then along the route to improved procedures, processes, and product.

Fifth, statistical knowledge can not be paid for by dollars alone, although consultants do have fees. In regular employment opportunity for study, library facilities, attendance at meetings and at courses, are important inducements, and the proper organization will include them, as it does for its high grade physicists and chemists.

The placement of statistical techniques in the operations where they will be most productive is primarily a problem in management. Why? Because statistical knowledge is a rare but productive commodity along the entire production line, from raw material to the consumer and back again. Statistical knowledge must serve all the stages of production, distribution, and design, yet it must not be subordinated to any of them. Proper statistical administration can only take place at a high level. Each department has its own work to do and cannot be blamed for doing it. The proper organization must be one in which statistical ability can be shifted about and directed toward whatever statistical problems appear to be the most pressing from time to time. It must be an organization that charges someone with the duty of discovering what problems confronting the company are statistical, and of finding the best possible solutions. What was a satisfactory organization ten years ago is now completely outmoded.

Outlined Functions of the Statistical Administrator

A new profession is at hand, and the statistical administrator to fill this job. His title is not important; his function is. It matters little whether the title of the man be "Statistical Administrator" or "vice-President in Charge of Statistical Techniques." He reports to top management, and is responsible only to them. He is a man who knows the plant and the company, the aims and the problems of the board of directors and of the plant supervisors, and of the distribution of the product. He differs from other men of these same qualifications (a) by knowing in addition statistical principles and the power of statistical techniques; (b) by the ability to recognize

statistical problems when he sees them, in any part of the production line, whether they lie in non-uniformity of raw material, testing or sampling of materials, high costs or high fraction defective in certain operations, variable productivity, variable results in sales, needs of management for statistical information from the company's records or from government agencies, need and evaluation of consumer research, design of the product, development of new products, standardization, and so forth.

He need not be a renowned statistician. He will hire people with knowledge of theory to do the actual work. He will be responsible for putting them to work where the problems are most pressing. He will be responsible for the promotions of these people, which will, of course, be based on results. In this way, people that help the company to produce a better product, cheaper, by the aid of statistical theory, will be rewarded. Bad statistical techniques will not have so good a chance to flourish; good ones will. New ideas will have a chance: they will not be buried.

Lack of Organization Results in Waste, Inefficiency

Failure of industry to provide proper organization (pleasing exceptions always understood) permits continued waste of materials, waste of manpower and machinery, ineffective sampling and testing for the purchase or for the distribution of materials, wrong statistical information on consumer reactions and on the performance of the product, wrong and tardy information on sales, ineffectual analyses and incorrect applications of current government statistical reports, lack of operating intelligence through failure to summarize their own reports and accounts, all of which could be improved by the use of modern statistical theory.

Professor Holbrook Working of Stanford University observed in 1942 that those companies which seemed to make the most rapid strides were the small ones. One explanation is not that people in small firms are smarter, but that a new idea has a better chance in a small company, and that horizontal motion from one point in a factory to another is usually easier in small companies. In too many big companies one finds superb statistical ability, here and there, but completely frustrated, helpless and useless, bound by an inflexible vertical organization, with no statistical coordination from the top of the staff.

The office of "Chief Statistician" is too often only an information centre. It needs to be vitalized to include the power of modern statistical theory.

The main requirement in industry is new organization—some channel for review of the statistical procedures in a company that will stop the bad practices: some responsibility and ability to suggest new procedures and to help to adapt better ones: statistical research in theory to produce needed techniques.

Industry can not suddenly create hundreds of statisticians, but it can create the best type of organization by which to make use of statistical knowledge.

Shortage of Statisticians is Severe, Growing Worse

A number of universities now teach statistical theory. But for every high-grade research man, industry and government need hundreds of men in statistical administration, men who think statistically, who know statistical theory as power, who know when to use a particular technique. The need is greatest in executive positions, because here lodges the power of placing statistical ability where it belongs, and recognizing and protecting real statistical ability.

There is no short and simple cure. The chief reason lies in the fact that, in spite of inspiring exceptions, most executives in industry and in commerce have simply not had the requisite background of education nor experience in the use of statistical techniques.

Schools of engineering, commerce, and business administration have not yet in general provided the opportunity for the studies that the statistical administrator requires. Statistical teaching in most countries is 15 or 20 years out of date, with no life in it, nor does it recognize the vital power in the application of statistical theory, or in statistical thinking. It will be even further out of date by the time our present students find out what they need.

Industry will therefore have to proceed in the forseeable future on the assumption that there will be a severe shortage of people who have had more than a rudimentary and unsatisfactory introduction to statistical principles.

For this reason, it is especially imperative that industry develop proper statistical administration, to make the best possible use of the statistical knowledge that does exist.

Schools of engineering, commerce, and business administration should teach statistical theory, not as an end in itself, but from the functional angle of power in the solution of man's problems. Theory can be taught as the sampling of human populations, the sampling of materials, the testing of materials, the testing of procedures, the testing of the performance of machines, the development of a new product, statistical problems of standardization, of control of processing, of acceptance, of consumer research, of the most economical inventory; all with the aim of furnishing reliable information at lowest cost on which to base predictions for the decisions of management, or for increasing man's knowledge, and not merely as studies of the analysis of variance, theory of sampling, theory of probability, theory of sequential analysis.

The basic theory and statement of principles are the same for all problems. This is why a small amount of theory, well-learned, is such a powerful tool. No other body of principles taught in school has wider applicability, nor can contribute more to the modern industry.

There remain two groups of people, with different requirements, and with different abilities. The teaching of theory from the functional angle is no substitute for the teaching of mathematical statistics, which must go on in the centres that are equipped for it. Mathematical statistics is the foundation of statistical research and of the statistical teaching of the future.

Use of Statistical Consultants May Relieve Shortage

What would happen if industry awakened to the need for theoretical statistical work from raw material to consumer? Increased production and all that, of course, but I am wondering about the supply of statistical brains. There would be a worse vacuum than there is now. Too sudden an awakening by industry could only draw incompetent statistical help, perhaps resulting in a set-back of statistical progress.

One partial solution meanwhile is to share statistical ability by making more use of high-grade statistical consultants. Whatever be the consultant's fee, he may bring dividends of 100:1. The sharing of consultants, and the elimination of rigid organization, to permit the rapid movement of statistical workers from one department to another within the company, would help toward more effective statistical work in production and in distribution, toward increased production, better qualities, lower costs, a more secure future for us all. END

What American Management Men Can Learn From Visiting European Executive Groups

by Wilson T. Seney

American management men can all too easily shun criticism from management people abroad. It is a national characteristic to feel our business is our own, to interpret criticism as interference. The fact to remember is that visiting groups from abroad come with a positive attitude. They are looking for something to admire, to copy, even to imitate; something to improve their own business. Out of their evaluation can come constructive, objective opinions on American management. This article tells what some visitors, chiefly British, have found, giving in detail ten particular characteristics of American management men that have struck admiration from European executives.

SOMETHING new has been added to the executive development programs so dear to the hearts of American businessmen. The irresistible opportunity to see ourselves as others see us, and to take advantage of that look, exists in reports published by some astute visitors to our shores. These visitors are members of the European productivity teams which have been investigating American management goals and practices under the auspices of the Economic Cooperation Administration (now the Foreign Operations Administration) (see CIPM Reports, page 31).

The reactions of these teams to our way of life have been widely reported in our periodicals and newspapers. However, such reporting has been largely in terms of the possible impact on Europe. It has not been pointed toward increasing our understanding of ourselves. (A notable exception is *Productivity Is an Attitude*, P. F. Drucker, NATION'S BUSINESS, April, 1952.)

So it is news to discover that Economic Cooperation Administration teams have given us a dynamic and constructive tool for helping to solve two of our toughest management problems. Of these two problems, one centers around the relationships of the controller with operating executives. The other problem, of particular interest to the top manager who is trying to develop executives, deals with the definition of standards for measuring executive performance.

Executive Performance is Difficult to Measure

The frequent lack of rapport between operating executives and the figure men is such common knowledge in our business community that comment is hardly required. Depending on the company involved, misunderstandings range from a relatively mild and mutual deprecation of the other fellow's value on the one hand, to a state of open warfare on the other. Regardless of degree, these conflicts certainly increase wear and tear on executives and may decrease the company's profit accomplishment.

The problem of standards of executive performance is essentially a problem of intangibles. Objective standards against which performance may be quantitatively measured are limited almost entirely to the area of current profit results. Even here, measurement of individual profit accomplishment is liberally overcast with judgment. The standards remain basically subjective in nature. The ultimate measure of an executive is the judgment of co-workers.

The controller is a particularly apt example of this principle. Apart from his participation in tax savings, he has no direct profit-making responsibility. Yet his staff services to management may contribute substantially to both long-term and short-term profits.

A study of how the controller functions in the management scheme should be a valuable case study in the exercise of standards of executive performance. Such a study is available in the ECA reports. Of the many ECA reports issued, three bear directly on the problem of American management and the controller.[1] All three are written from the controllers' point of view, because all

1. *Management Accounting*, Anglo-American Council on Productivity, London, 1950 (hereafter referred to as *British*); *Cost Accounting and Productivity*, Organization for European Economic Cooperation, Paris, 1952 (hereafter referred to as OEEC); *La Compatabilité Mesure et Facteur de Productivité*, Ordre National des Experts—Comptables et Comptables Agrees and Association Francaise pour l'Accraisement de la Productivité, Paris, 1952 (hereafter referred to as *French*).

three teams were interested in investigating "the good effect which accounting information . . . has had upon productivity in American industry."[2]

The role of one type of American management man, the American controller, is clearly described in the ECA reports. Since the position of controller does not exist in Europe, the descriptions are characterized by a freshness and clarity of objective insight.

"It's an essentially positive role," say the French. Our visitors are impressed by several qualities of the "composite controller," as they see him—his position as a member of top management; his emphasis on forecasting and planning rather than on historical accounting; his assistance to operating executives as coordinator and interpreter of management information; his "service" concept; and the flexibility of his approach to systems.

The picture they paint of the controller and his role is attractive. Furthermore, the picture is surprisingly consistent in all three reports. Taken at face value, it indicates that there is little, if any, room left for improvement in our controllers and their methods. But, in the best tradition of American managership, no statement should be taken at face value; we should evaluate these comments before accepting them in full.

Visitors See Best Companies, Take Positive, Over-all View

In the first place, our visitors' views probably reflect our best existing practices. Most of the companies studied are blue-ribbon outfits which are staffed at the top by sophisticated, expert managers who utilize advanced management techniques.

Secondly, the "over-all look" approach used by our visitors tends to simplify and rationalize any situation. A good deal of the time of these visits was no doubt spent in discussing goals and aims. Such discussion, when combined with a natural tendency to put our best foot forward in the presence of company, could result in accepting goals as actualities to a greater extent than is really the case.

Finally, our visitors are constructive. They were looking for things which they could take home to use, not for things which they could not use. Therefore, they emphasize the positive.

Precisely here lies the value to us of their comments. What they emphasize in the ways we operate are the goals, attitudes, and practices which they admire. They identify these goals, attitudes, and practices as causes of our industrial productivity, and they look forward to transplanting them insofar as is practicable to their own lands.

The practitioner of management will find nothing new in our visitors' analyses. But he may profit by the perspective of distance.

The ECA reports spend as much time in describing the American manager as they do in describing the American controller. There is unanimous agreement that, in the final analysis, the operating end of the business sets up the requirements for accounting services.

ECA Reports Provide Useful Standards For Judgment

Therefore, the comments of our European visitors regarding what manner of man they admire may serve as a check list for the top manager and operating executive. Is the manager displaying the management strengths for which our visitors give him credit? And is he providing the climate in which his controller can perform most usefully? Although this article stresses what the controller can do to increase his effectiveness, there is no intention to place all the burden of improvement on him. Improvement of executive relations is a two-way street.

The controller who understands his job knows that he serves management and at the same time is a member of management. And he knows this without reading the ECA reports. However, these reports do give even the most sophisticated controller a two-fold opportunity. First, he can compare his understanding of the way an American manager runs an enterprise with the ECA descriptions. And second, he can judge himself against the standards of service set up in good faith by our accounting friends from across the sea.

What then are the goals and attitudes of the American manager which should be understood by the controller if the manager is to have the help he needs and if the controller is to play his part harmoniously? According to the productivity team reports, the American manager has the following characteristics and interests:

The American manager wants to accomplish: The American manager is an energetic and ambitious man who spurs himself to ever greater accomplishments. Speaking of the way American managers operate the English team says:

"Their method is to set themselves targets which are as high as appear from facts and forecasts to be capable of achievement. They are continually measuring their actual results against the target they have set themselves. They have no hesitation in changing plans, methods, procedures, or organization if they think they can get nearer their target by doing so. They have equally no hesitation in changing their target if changing circumstances make it unattainable or too easily attainable. These principles and methods are applied right down the line."[3]

The controller, if he is to be successful, should be thoroughly sympathetic with the emotional slant and energy and drive of operating executives, and he will be the more successful when he has some of that energy and drive himself. As the French accountants note, the controller's role here is a tough one. Sales, production, and other executives, however important, have views colored by the needs of their own activities. Often, the controller is the one who puts the effects of these activities (or planned activities) together to give a completed picture to top management. In exercising this function, "the opportunities of the controller are limited only by his imagination, his ability to work with other members of the top management, and the depth of his judgment. If he can hold a picture of the whole without getting into conflict with the particular aims of each group in the enterprise, he ought to make a very important contribution both to top management and to each major functional division."[4]

Controller Should Act as A Balancing Force

If, on the other hand, the controller is unsympathetic toward the motivations of his fellow executives, he is well on the way to building his reputation as the foot-dragger and obstacle-builder in his company's management. This does not imply that the controller should always say "yes" to contemplated company actions. One of his functions is to take a balance-wheel point of view. Actions cost money, and money should be spent when profits are assumed to result. However, in raising his questions, many a controller would do well to remember that his fellow executives are just as interested in making profits as

2. British, page 1.
3. British, page 14.
4. French, page 34.

he is, and that their actions are generally put under way with that end in view.

The American manager looks forward: To the American manager, "accomplishment" means future achievement, not past performance.

"American managements are continually looking towards the future. Their policy is to anticipate and influence events by their decisions rather than merely to carry on as before until events force them to make new decisions."[5]

In response to this forward look, the controller has developed budgetary control to a degree which is impressive.

"Forecasts and estimates are not new to the business world; they might, indeed, be described as the very basis of comerce. What is original in America is the precision of the methods used . . . Few European firms draw up budgets in this meticulous way or use them as an instrument of management control."[6]

Controller Must Participate in Company's Forward Planning

Obviously, the controller who contributes to the forward look should be fully informed about management's future plans. And this happy situation is noted by our visitors. However, the writer (and no doubt the reader, too) has heard more than one controller complain that events take place in the factory or out in the selling field without prior notice to him, so that he has to improvise ways of handling transactions when they hit the office.

Perhaps such a controller should examine his position, his attitudes, and his actions carefully to determine whether he is using the right approach to achieve the desirable position of being a full participant in the forward planning of his company.

The American manager is objective: The British stress "The desire of (American) management to base its decisions on facts and reasoned forecasts and its consequent insistence on being given the necessary information and explanations."[7]

The controller may recognize in this basic management attitude a major opportunity to establish pleasant working relationships and a major challenge to increase his own usefulness. Certainly, some controllers working the right way in the right environment have been outstandingly successful in earning appreciation of their services. One group of our visitors goes so far as to say, "The impression was overwhelming that management, from foreman to president, appreciated and welcomed the assistance which the industrial accountant could give . . . The accountant and his work were not suffered—they were enjoyed."[8]

And the British go slightly overboard in agreeing that:

"The friendliness and understanding between the controller's department and the shop supervisors is remarkable . . . In Britain there is a tendency for foremen and even works managers to regard the accounts department and the cost office as watchdogs and spies (but) in the United States everyone connected with shop management looks upon the controller's department as an essential service to production and not merely as outsiders charged with putting a curb on expense."[9]

On the other hand, merely quoting the above remarks bring instantly to mind some cases in which the situation is not so rosy, and where objectivity does not permeate the whole organization. Our visitors are perhaps too polite to talk directly about one of the reasons why friendliness and understanding do not always exist. Or perhaps, the position of the European accountant is so different from the position of the American controller that our visitors do not recognize the problem. In any event, we find no direction mention in the ECA report of the controller's (or his assistants') seeking for credit in the eyes of top management at the expense of operating executives. This is, however, not a serious omission, because such cases are not as common as might be thought from reading either *Executive Suite*[10] or *The Impact of Budgets on People*.[11]

Lack of True Objectivity Hinders Realistic Reporting of Facts

A more common cause of failure to achieve good working relationships is the tendency of some controllers to become confused between operating objectivity and bookkeeping objectivity. Adept controllers lead our visitors to comment,

"American practice is influenced to only a minor degree by the rigidity of financial accounting and less importance is attached than in Europe to exactness and the need for precise reconciliation with the financial accounts."[12]

Therefore, it would be well to maintain an open mind when an operating man criticizes accounting reports. It may be that the operating man is not displaying the utmost in objectivity, or it may be an indication that accounting conventions or just plain bookkeeping habits are interfering with realistic reporting of fundamental operating facts.

Free Competition Makes An Important Impression

The American manager races against competition: The grim, but dynamic fact of free competition in America impresses our visitors.

"American management's perception of the need for high productivity at low cost is sharpened by the knowledge of the penalty of failure, possible loss of business to competitors, and ultimate bankruptcy. Not for it the soft cushion and the comfortable feather beds of price agreements and quotas."[13]

And the OEEC team concurs, expressing the opinion that, thanks to free enterprise and a high competitive market, American management has been made acutely aware of the economic fact that only those who keep their business efficient will survive.

Five aspects of the American manager's competitive practices impress our visitors. According to them, the American manager: (a) Bases his competitive planning on an expanding market, (b) Tirelessly pursues cost reduction objectives, (c) Takes calculated risks for profits, (d) Pays scant attention to protecting business secrets, (e) Insists on speed. Each of these five aspects is treated briefly below.

The American manager seeks the expanding market: "The constant aim for higher volume"[14] and "the belief that the right to increased profits is through an increase in production and a decrease in cost"[15] are recognized as mainsprings of American executive action.

"The raising of the standard of life is a religion to Americans,"[16] say our British cousins.

The American controller, as well as the operating executive, exemplifies

5. British, page 14.
6. OEEC, page 35.
7. British, page 18.
8. OEEC, page 19.
9. British, page 26.
10. *Executive Suite* by Cameron Hawley. Houghton-Mifflin, 1952.
11. Op. cit., page 1.
12. OEEC, page 30.
13. British, pages 6-7.
14. OEEC, page 21.
15. OEEC, page 75.
16. British, page 7.

these habits of thought. For instance, the use of sales forecasts as the bases of budgets is almost automatic with us, even though our visitors find it worthy of extended comment and description.

Accounting For Distribution Costs is Underdeveloped Field

In one important phase of this area, however, accounting has generally not kept pace with management requirements. The field of accounting for distribution costs, as is recognized by a recent and growing literature in our own accounting publications, requires considerable development before distribution costing and reporting techniques approach the effectiveness of production costing and reporting techniques. The controller who is looking for ways to increase the effectiveness of his accounting services should examine his company's distribution picture to see if enough management choices exist therein to make costing of alternative distribution techniques worth while.

The American manager wants costs reduced: Observers from England found cost consciousness to be the outstanding feature of the American industrialist. They add that:

"American management has, as the mainspring of all its actions, the well-founded belief that unit costs must be reduced each day and every day, week in and week out, year in and year out. *This habit of thought is so natural to American management and accountants that it is taken for granted.*"[17]

"Policy is, therefore, largely determined by two considerations: continuous reduction of unit costs and, as a means to this end, the constant aim for higher volume."[18]

The contributions of the controller in implementing this concept, as through the installation and administration of a standard cost system, were found to stimulate the cost consciousness of all executives and to encourage individual action to reduce costs.

"Practically every company uses some form of budgeting, although it is often called by other names. Some form of standard cost is more often than not in use. Historical costing was seldom found."[19]

The moral for the controller: the manager is interested not in what costs have been but rather in what they should have been, and in what they should be in the future. And the manager is especially interested in corrective action.

Cost reduction does not occur because the controller knows what costs are, our visitors make clear. Costs are reduced only when action is taken. Action is taken when cost figures are really understood by the managers in a position to reduce costs. Our British friends saw outstanding examples of report issuance backed up by immediate conferences of operating and accounting personnel. In these conferences, the figures were reviewed, their significance was discussed; and plans for corrective action were decided more or less on the spot.

Americans Ability To Take Studied Risks Appeals to Europeans

The American manager takes calculated risks: The American manager's characteristics are a response to an environment which allows relatively free action to business enterprise, with rewards of profit and penalties of loss. Technically, this means that the American manager can operate more freely than his European counterpart in controlling his company's cost-price-volume picture. And on this basis, he calculates his risks:

"He seldom makes any decision of importance without comparing the cost of the proposed action with its expected financial results. This does not simply mean cutting costs . . . it also means not missing opportunities. He will just as readily embark on large-scale and ambitious expenditure if the rewards for doing so appear sufficient."[20]

The freedom of choice exercised by American management is a major reason for the very existence of the controller's position. Constant consideration of and experimentation with new products, new services, new methods of manufacture and distribution, and new investment of funds—all of these call for the constant services of management accounting. Conversely, the relative lack of freedom of management choice in Europe is a major reason for the nonexistence of the position of controller in European business. Perhaps the most fundamental observation on the reason for existence of the controller is that:

"It is clear that the accountant who will be most useful to management is the one who can forecast the financial implications of alternative policies; in this way he will make the most effective contribution to industrial efficiency by spotlighting trouble sufficiently far ahead for management to be able to make a more intelligent choice and so avoid it."[21]

(The somewhat negative cast of this quotation may be forgiven on the basis of the reputation of the Englishman, or the accountant, or both, for conservatism.

Here is the controller's major challenge in his path to full acceptance as a member of top management. It is perhaps indicative of the current stage of development of industrial accounting that the most significant figure relationship in business—namely, the cost-price-volume relationship—is not susceptible to easy or clear treatment in orthodox financial and accounting statements or operating reports. However, the development of break even chart techniques, direct costing techniques, and similar devices do make it possible to forecast, interpret, and analyze these relationships in useful ways. Graphic presentations and statistical data are mentioned by our visitors in connection with attempts to forecast and explain the influence of volume on profits; to investigate market potentials at varying price levels; to study the profit potential of new products or methods; and generally to predict or control profits by the manipulation of volume and pricing respectively. They also discuss the advanced development of studies of return on investment.

Our visitors find, as might be expected, a wide variety of practices in dealing with this fundamental problem. Their impressions are backed up by our own literature in the field, where direct costing (as an example) is receiving increasing recognition. In practice also, more and more companies are developing break even charts and similar techniques in order to achieve a clearer grasp of cost-price-volume relationships.

The controller who is imbued with the top management viewpoint will recognize the fundamental importance of developing the tools to control cost-price-volume relationships. Once this need is recognized, the forward-looking controller will devote time and effort to developing the proper tools.

American Shares Information With Competition; Startles Visitors

The American manager shares information with the competition: American management's comparative lack of regard for "business secrets" is somewhat startling to our visitors. For instance, they find the published in-

17. British, page 7.
18. OEEC, page 21.
19. British, page 15.
20. British, page 37.
21. British, page 46.

formation in annual reports issued by American companies to be amazingly full. They are equally impressed by the widespread accumulation and circulation of business statistics under the auspices of both private and governmental agencies. They underline the fact that most of "the information collected is not compulsory and close cooperation exists between the Government agencies and industry."[22] In the midst of our customary bickering between bureaucracy and business, it is rather refreshing to hear that we take for granted a degree of cooperation between them which looks new and strange to those from across the Atlantic.

The availability of this information is, of course, made to order to answer the American manager's continual question: "How are we doing, and how is our competition doing?"

Professional Organizations Provide Important Contacts

If the controller expects to do an intelligent job of answering this question, association activities should claim some of his time. Obviously, other executives will more actively represent the company in trade association and related groups. However, this should not bar the controller from participating in outside activities which could add to his understanding of his industry and of his company's position and prospects within that industry. A word of caution: the fact that most information on competitive position can be reduced to actual or estimated figures does not give the controller a monopoly on answering the question of competitive position. Sales managers and technical men with their external contacts usually serve best to keep the company up to date.

However, the controller can do his part by utilizing governmental industry and economic data as yardsticks against which to plot company trends and positions. It is a commentary on the stature of the controller when he prepares for other executives statements of the company's position against such yardsticks. It is equally a commentary on the controller's lack of stature when this information either is lacking or is being procured, maintained, and interpreted by members of management outside of the financial and accounting group.

The easy issuance of business information, both through governmental channels and by voluntary cooperation, presents yet another challenge to the controller. Characteristically, the controller is regarded as a guardian of company secrets. Popular misconception pictures a fellow in a green eyeshade who rushes around clutching confidential ledgers to his breast. Actually, the controller deals in information on a wholesale scale. He habitually publishes more information both inside and outside his company than any other single executive. He should, therefore, continuously display good judgment and sensitivity in respecting confidences on the one hand and in conforming with legal and operating requirements on the other. Within his company, he should avoid distributing information which, although interesting, would add nothing to the effectiveness of planning or performance. Yet at the same time he should be cooperative and constructive in providing, exchanging, and accepting information which is useful to other executives in the performance of their responsibilities. In dealings outside of his company, the controller's actions are, of course, circumscribed by laws and regulations. However, even in this area, he has the opportunity to deal with government agencies graciously while at the same time ensuring that his fellow executives understand what must be reported.

Accuracy Often Sacrificed For Speed in Current Reports

The American manager insists on speed: In a race with competition, speed is a major factor of success. In addition, constant experimentation with new ways of doing things means that almost always the management is impatient to know current results currently.

American controllers have met this challenge with reasonable success. In commenting on our reports to management, the British accountants observed that the promptness with which they were prepared was impressive. They attribute this to the fact that,

"Close working with the managers has produced in the controllers an acute consciousness of the time factor in the submission of reports. They are prepared to sacrifice bookkeeping accuracy in order to get quick results."[23]

The OEEC team agreed. Comments were also made on the willingness of American management to spend money on office machinery and equipment in order to increase the promptness of reports. It is also pointed out that cost information may be expressed in units of time or material rather than money.

The controller who wants to measure his performance against the standards described by our visitors might review the tempo of two of his activities—the provision of formal dollar statements and the provision of operating statistics. With respect to the first, our visitors comment on one company in which cost reports are available on the third day, and gross profit results by the fifth day after the close of the month. Our own literature has devoted sufficient attention to quick closing practices[24] so that the controller who is coming up with returns 15 or more days after the close of the period knows that he is lagging.

Controller Must Provide Accurate Information on Day-to-Day Basis

Lateness of formal, inclusive reports may be condoned if operating statistics are provided skillfully and promptly for current operating control purposes. The typical manager needs to know orders, shipments, purchases, production, number of people on the payroll, and a host of other matters, and he needs to know them right now. The controller who attempts to stop the flow of these figures in order to put them through a double-entry system or to make them jump through other control hoops is going to find that he is the victim of an end run, and that operating people will provide the figures themselves. Still less stature has the controller who thinks that figures are none of his business unless they are entered on the books. The real challenge is for the controller, as the man who is in charge of the production of figures in his company, to develop effective techniques for providing day-to-day information on a current basis, at the same time providing safeguards that the information is reliable and ties in with controls.

Reduction in Routine Reports Provides Greater Flexibility

Achieving speed of report issuance, whether of formal statements or of operating statistics, involves more than streamlined procedures. It also depends on a flexible approach seen by our visitors and described as follows:

"The controller in many companies makes every effort to keep routine reports to the minimum. He and his staff devote more and more time to the compilation of special nonrecurring reports

22. British, page 61.

23. British, page 38.

24. For example, "A Program of Financial Planning and Controls," pages 49-55, American Management Association Financial Mgt. Series, Number 103, 1953.

on subjects which are occupying the attention of management."[25]

The controller who is interested in providing usable, timely figures keeps his decks cleared for action by scrapping reports which have outlived their usefulness—and he finds that this is a continuing activity.

The American manager is a team player: In achieving his objectives, the American manager has developed some characteristic organization practices. And his practices pay off in results. The British state frankly:

"One of the measures of the effectiveness of management is its ability to use the means of production at its disposal —the men and machines—without overstraining either and to produce the greatest output at the lowest cost. One of the main differences between American and British practice in management is that American management recognizes this."[26]

American Management Stresses Individual Responsibility

The American manager has developed the fine art of organization on the solid basis of recognizing the value of the individual man. As compared with his European counterpart, he shares the burdens (and privileges) of management with as many other people as possible. He believes, both for himself and for others, in individual responsibility for performing in accordance with an over-all plan. He does not believe in a few people giving orders and many people obeying blindly. The teamwork nature of his management practices is tersely described by our visitors:

"Centralization of control but decentralization of responsibility is the keynote of American management."[27]

"This is contrived firstly by making full use of specialized staff departments and secondly by giving all levels of management authority commensurate with their responsibilties, down to and including the foreman, who in America has acquired a higher status than his European counterpart . . . There is a remarkable degree of delegation of authority and responsibility to the lower levels."[28]

The way in which this concept of organization is put to work is summarized as follows:

"(It) is facilitated by extensive planning which closely defines the limits of authority and responsibility, and by the subsequent control through effective accounting systems."[29]

"Once a target has been set . . . the officers expect their managers and foremen to reach that result . . . They give guidance on policy . . . but do not interfere in what is properly their subordinates' responsibility . . . One of the consequences of this attitude is the necessity for determining exactly for which items of expense and for which results each manager of foreman is responsible. This has the very valuable effect of requiring a clear-cut (plan of) organization . . . A further consequence is the necessity of getting subordinates to agree to the standards by which they will be judged."[30]

And finally, the follow-up control is described:

"A good reporting system is a sensitive instrument . . . keeping continuous record of the course of operations and giving instant warning should anything unusual occur. Thus the employees feel that their work is constantly brought to the attention of management, and management in its turn feels it can rely on the reporting system to give notice of any need for its intervention."[31]

Admittedly, the above description makes everything seem very simple. The quotations do not do justice to our visitors' appreciation of our executive development programs and other personnel practices. Neither do they reflect our visitors' awareness of our use of engineering and other operating controls as distinct from accounting and statistical controls. However, the description is valid in pointing up *the fundamental interdependence of organization planning and accounting controls.*

Interdependence of Planning and Accounting Based on Two Factors

This interdependence is properly recognized as the basis for the controllers' acceptance as a member of top management:

"The relationship of the controller to management is governed by the following considerations:

(a) management's desire to use budget and cost systems for planning future activities, setting targets for immediate action and for managerial control, and

(b) the realization that adequate authority, so necessary for effective management, can be delegated with the aid of budgeting and forecasting to a far greater extent than without these procedures."[32]

Everything in the preceding paragraphs is quite well known, in theory at least, to a large business population.

The vitality of these concepts is found in the observations of our British cousins when they observed blue-ribbon companies, where they found that "All levels of management from top management to foremen . . . are familiar with figures and have a marked ability to absorb information in this form."[34]

Europeans' View is Both Clear and Practical

Our astute and interested visitors have given us something to think about and to use. In spite of any mental reservations about the depth to which they have probed, we must, I believe, admit that they have seen our management and controllership practices in clear perspective. And they have seen them in the very practical perspective of men who are looking for tools to use at home. Their characterizations of American management, their explanations of the controller's role in management, and their descriptions of the service concept of controllership are worthy and usable additions to our business literature.

Executives who are designing or administering executive development programs may find in these productivity team reports material of considerable value. For supplementary reading, training courses, and class discussion especially, they offer a fresh expression of executive goals and methods. The individual executive who is interested in finding out what his counterparts in other companies are doing can find considerable material in the reports.

And finally, any management man who is interested (and who isn't?) in achieving easy and constructive working relationships between accounting and operating personnel, between sales and production, between personnel and engineering, or any other executive groups, can find some help in these reports. If he is a new executive, he may find things he does not know. And if he has been through the mill, he may find things clearly stated which he has forgotten, or has forgotten to use recently. END

25. British, page 15.
26. British, page 6.
27. British, page 21.
28. OEEC, pages 19-20.
29. OEEC, page 20.
30. British, page 22.
31. OEEC, page 66.
32. OEEC, page 27.
33. British, page 15.

A New, Basic Field For Cost Reduction — Lowering Costs In A Company's Toolroom

by Donald R. Sunderlin

The toolroom has too long been regarded as one department of the plan where controlling factors in results are individual skill and ingenuity rather than standardization, organization, and executive control. Usually this attitude has spread to encompass the entire toolroom operation and exempt it from some of the controls that produce beneficial results when exercised over the productive departments. This author takes exception to the general attitude, and tells how waste can be attacked in this area

Tools whether or not they are made in the company's toolroom must do the job for which they are intended or the quality of the product suffers. They must be ready for use when the Production Planning Department expects them or production will be held up. Beyond the elements of quality and time, the day has arrived when the cost must be within reason and this applies to private toolrooms as well as Job Shops. While exorbitant tool costs may be absorbed by some companies to whom tool-making is incidental, unduly high quotations cause Job Shops to lose orders to shops whose costs are in line. To make matters worse, Job Shops whose prices are too low, as a result of their not knowing how to estimate accurately, deliver the equivalent of currency with each underpriced tool they ship. It, therefore, is desirable for manufacturers to know what their tools should cost and for Job Shops it is a matter of success or failure.

Every factory manager knows that there are frequent occasions when the toolroom is the bottleneck in his production, and he would joyfully welcome a practical way of improving his control of that important function. In any business where tool cost is a considerable factor the manager has another good reason for wanting better controls, but the methods applicable to cost control in routine productive departments are not much help in dealing with this type of operation.

If the tool room is on day rates and the other departments on incentives, the success of the latter tends to raise the day rates in the toolroom without inducing any compensating increase in the amount of work done. On the contrary, in several cases studied, this tendency accentuates the causes of a prima donna attitude on the part of the toolmakers and, in fact, when toolroom production is brought under control, it is not uncommon to find that the highest paid men are actually doing less work than some of the others. To rectify this without destroying the usefulness of such top-rated men requires a wage plan that makes it possible for them to equal or increase their earnings and, at the same time, reduces the cost and delay of toolmaking by better organization of the work and utilization of time.

The purpose of this article is to describe such a plan—one that has been developed through successful use over a period of 20 years in a number of plants of varying size and product. The foundation of the plan is a simple method of applying a compilation of thousands of time studies to improved planning of toolroom work, which not only serves to expedite that work but measures the contribution of each man for incentive calculation and provides the management with reliable and informative data on work loads, machine loads and man-performance. While it may be impractical for most firms to undertake a comprehensive time study program for their own toolrooms only, the availability of the extensive compilation referred to saves the delay and expense of such a program and so makes engineering standards practical for almost every toolroom.

Compilation Sets Standards For Any Toolroom Job

The standard data are expressed in terms of points, a point being one minute's worth of work at a pace within reach of any qualified workman, taking into consideration fatigue and similar allowances. Machine time standards are included for all operations on various types of metal, so that the whole compilation contains all the information needed to set a standard for any ordinary tool-room job. Familiarity with

these data enables the tool-estimator to specify in detail the quickest (lowest cost) way to do each job from the print and to establish the total standard points to be credited to each man doing the work. In toolrooms large enough to use specialization, the operations are grouped according to the degree of skill required, which yields an additional saving as the company does not pay toolmaker wages for machine operator work. After a period of training, a reasonably intelligent estimator becomes so adept at this process that he can handle the work for over thirty men in the toolroom which, incidentally, has been found to be invaluable experience for a job as foreman in that department.

Cooperation between the estimator and foreman relieves the latter of some detail, improves the information on which his allocation of work among his men is based and gives him more time for training, instructing and following up his men. By having all the work rated in uniform units, the work, irrespective of the nature, is reduced to a common denominator. Then, by totaling the points weekly or daily, it is easy to give the management a current measure of the work ahead and in process and also expected completion dates, which is important in planning the work so as to have production tools ready when needed.

Point Plan Gives Real Incentive to Toolmakers

The point plan is easily understood by the toolmakers and gives them a real incentive to turn out the necessary work as accurately and quickly as possible. In one case, the production of the apprentices was measured in the same manner as that of the journeymen. For the first time the chips around the shapers were blue and the boys indicated a real interest in learning the trade, whereas, formerly, they had to be chased out of the washroom which was used primarily for shooting crap. No credit is given for work that does not meet specifications, although all time worked on jobs that do not enter into the total point computation is paid for at the man's guaranteed hourly rate. Thus, the point plan does not interfere with experimental work nor production work done in the toolroom. Neither does it conflict with existing hourly rates of pay, which are guaranteed to those on the toolroom payroll when the point plan is inaugurated.

Excerpts from letters written by executives who have used this form of control, in reply to inquiries from other executives who were considering using it, indicate client reaction which perhaps is the acid test of the plan's practicability.

"The savings have been very satisfactory, and the amount spent for the service has been repaid us many times. The reaction of the men is very favorable based on the fact that the departments where it was late in getting the standards applied, were very insistent in many cases getting on the standard application, knowing the results in other departments."

"As we know you maintain an open shop the same as we do and the perfection of your work requires the highest grade of tool work, I feel free to pass this information along to you, as I believe it will be worthy of your consideration."

Man-hour Output Tripled In One Factory

"The application of Incentives to our Toolroom has resulted in an increase of output per man hour of about three times. We believe that this is a normal expectancy as, in our opinion, Toolrooms are generally the least efficient departments in the average plant from a cost standpoint. In a discussion of Incentives, the foreman of our Toolroom referred to his own experience in another plant before coming to us. In the other plant, the less competent toolmakers received considerably higher rates because they had greater seniority. When he came to us, he began as a tool-maker, and his ability and speed were properly compensated for under the Incentive System, and he has since been an enthusiastic supporter of it. This bears out our own experience, for the application of Incentives demonstrated that several of the highest paid men in the department prior to Incentives, turned out to be actually the slowest men."

"There was some employee resistance when the system was first installed, but later, after operating for a number of months, the increased earnings of the ambitious toolmakers, brought about general acceptance."

"Should you desire to have someone investigate our system, he has volunteered to show the installation in detail. If you should decide to accept his offer, I shall gladly arrange a convenient time for you or your representative to call. I mention this as I would much prefer that you investigate our system and apply the principles to your individual requirements. For our needs, it is operating satisfactorily."

Whether or not the shop is organized may appear to some as a major consideration in determining the applicability of the subject plan. Our experience leads us to believe that this was of minor importance at any time and that this is particularly true today when management generally is again assuming its rightful prerogatives. Similar to the sharp tool in the hands of a skilled mechanic becoming a hazard in the hands of a novice, there are ways of successfully installing incentives that perhaps can only be learned by experience but it has been done many times in the past and it undoubtedly will be done many more times in the future.

Rather than to suggest organized labor as a hindrance to the successful use of this plan, it would be more pertinent, we believe, to question the calibre of management. On this score it seems fair to say that only progressive, skilled and open-minded management can hope to install and properly utilize a control of this kind.,

As a rule, there are several classifications of man in the toolroom, with either uniform or bracket rates for each class. Leaving these rates undisturbed as minimum guarantees, base rates are established for each classification and incentive earnings are computed on these base rates, sixty points of work per hour being the standard that the base rate represents. Premiums can be figured on either a daily or weekly average of production, depending on circumstances.

The premium rate is usally 60 percent of the job base rate which yields increased pay of approximately 20 percent when incentive pace is reached. For example: Base rate—$1.80 per hour, or 10.6 hours earned in 8 hours = 2.6 premium hours x ($1.80 x 60 percent) equals $2.81 daily premium.

The guaranteed hourly rate could be higher or lower than the base rate but the premium computation would be as indicated.

Toolroom Efficiency Increases Production, Lowers Costs

While, at first glance, this plan may seem to be too liberal, it should be remembered that useful production is about twice the amount turned out on day work. To promote higher production at the time the incentive plan goes into effect, it is customary to provide

helpful suggestions and instructions on ways to reduce waste time. The overall outcome is to utilize toolroom time to much better advantage, both as to men and machines, and so increase productive work at lower cost. In one instance, the productive increase was in the neighborhood of 200%. On the average, this plan has shown a net decrease in cost of about 28% and an increase in individual earnings of approximately 20%.

In companies with limited facilities, such results mean that fewer tools, dies, fixtures and jigs have to be made off the premises. The cost savings accruing from the toolroom products themselves, are augmented by the savings in productive departments through having serviceable tools ready on time and these are decidedly not minor. An incidental advantage is that the accurate cost estimates provide an excellent means of checking outside tool quotations thus enabling management to contract only that work on which quoted prices are reasonable.

Point Plan Is Both Incentive Plan and Control Improvement

The point plan, then, is at once an incentive plan for the toolroom and a means of improving control of that important department by the management. Since practically all self-respecting workers, from the president to the apprentice, prefer to work under a plan that makes it worth while to exert themselves, the dignity of the toolmaker is not injured when his standards of performance are determined by established engineering measurements. When an incentive plan is soundly conceived and fairly administered—in other words, when it is a genuine incentive plan—it serves both management and employee.

The same advantages are to be gained by using a sound and tested measurement and incentive plan for toolroom work. The benefits to management are obvious and the toolmaker, if he really possesses the skill he claims, can make himself more money without sacrificing his reputation for versatility, skill and ingenuity. In fact, it is by making the most of his capacity through cooperative stimulation that the improved results are accomplished.

To provide a direct comparison between day work operation and point plan operation, prints of complicated dies, average fixtures and simple tools such as the one illustrated were sent to a company which has been operating under the described plan since 1935.

Illustration Of Standard Data
Shaper Standards

DESCRIPTION	1st	REPT.
Job Standard Difficult	10.0	
Job Standard Simple	5.0	
TOOLS		
Tool holder in and out	0.7	
Finish spring tool	1.0	
Change bit	0.4	
Grind bit	1.6	
Grind bit dovetail	10.0	
Parallels on and off	.8	
PC. IN AND OUT OF VISE		
On parallels	1.1	0.9
On parallels using knife edge	4.5	2.0
Set squarely	1.4	1.1
Set to line	1.5	1.3
MACH. ATTACHMENTS		
Vise on and off	7.0	
Angle Iron	23.0	
SET UP FOR FIRST PIECE	10.7	

DESCRIPTION	
MACH. ADJUSTMENTS	
Raise or Lower knee	2.5
Vise to Angle	2.8
Clapper to Angle	0.7
Change Speed and feed	0.2
Set stroke	1.4
Table to angle	2.5
Head to angle	.7
SPECIAL OPERATIONS	
Clean up after oil cut job	5.2
Scribe line	0.2
Set Comb. square	0.8
Per clamp used	0.7
Per block used	0.4
Chip sand spot from casting	0.4
CHECKING	
Indicate vise jaw	9.0
Fit piece to layout	6.0
Mic. Scale, Caliper, Gage, per try	.4
Try piece for squareness	.8

CUTTING CHART

DESCRIPTION OF CUT	SET CUT 1st	SET CUT 2nd	CUTTING FACTORS PER SQ. IN. CL. I	CL. II	CL. III	CL. IV
1/8" Roughing cut	.50	.30	.09	.12	.16	.23
1/4" Roughing cut	.50	.30	.12	.18	.20	.28
1/4" Roughing cut vertical	.60	.....	.13	.20	.22	.30
Finish cut (ordinary)	.70	.....	.09	.12	.15	.21
Finish cut (broad tool)	.....	.....	.....	.03	.....	.....
Finish cut (fit-size)	.90	.....	.18	.23	.30	.41
Roughing 1/32" of line (contour)	.70	.....	.28	.35	.47	.65
Finish cut easy curve	.90	.....	.57	.70	.95	1.30
Finish cut sharp curve	1.00	.....	1.10	1.40	1.90	2.60
Finish cut vertical	.60	.....	.28	.35	.47	.65
SHORTEST STROKE TO BE USED			3"	2½"	2"	1½"

USE ½" OVER STROKE ON ALL CUTS

The tools were estimated in the usual manner without the Estimators knowing that a test was being made.

Tool No. 72307E was selected as an illustration for this article only because it was simple. The potential savings in percentage were approximately the same in each of the other cases.

In the tool room of a very large company noted for its good top management, four of Tool No. 72307E were made on day work in 25 hours. If these had been made on incentive in the tool room where the estimating was done, the work would have taken 10 hours under average conditions. The company would pay for 13.4 hours, a saving of 11.6 hours or 46½%. Since this company pays for all time saved at the base rate of the job, the toolmaker's regular hourly earnings therefore would be increased by 13.4 over 10, or 34%.

Many advantages accrue to Management and Labor through the use of this plan. These advantages are of particular interest today when profits and even survival, in some cases, depend upon better operation and tighter control over costs.

Fortunately, for Management, there is is no corner on the use of this idea and a qualified Wage Incentive Specialist with toolroom experience possesses the ability to make a successful application.

The data described facilitate making the application but similar data have been collected by a number of the top flight management consulting firms. Therefore, the progressive factory manager or Job Shop owner has several ways to attain the objective. END

The Dynamics of the Manufacturing Interval

by W. Van Alan Clark, Jr., and William E. Ritchie

In the light of The Society's expansion to include a Material Handling division, as well as in recognition of the increasingly important part material handling is coming to play as a force in modern business, AM presents an article unique in that it gives a clear suggestion of how the present-day management man can approach an understanding of material handling. The article stresses study of a company's over-all manufacturing system as a technique of analysis, and first appeared in AM in April, 1953

TODAY, in many firms, management finds it increasingly difficult to gain an over-all appraisal of the company's manufacturing system. Specialization of personnel along functional lines is now a pervasive part of most manufacturing organizations and is common within many industrial consulting firms. Although each problem area is well covered, no one group is apt to study the firm's production system as a whole to discover how well it meets the company's over-all manufacturing and sales objectives.

An approach to this problem, which has worked well in a number of companies, is a study of the firm's manufacturing interval. The manufacturing interval is simply the actual time required to manufacture a product. It includes the span of time between the appearance of materials ahead of the first operation and the arrival of the finished product in the shipping room or in stock. This interval is usually much longer than the sum of the operating times involved in processing the product; it is generally much shorter than the total time required to process an order when the product is not immediately available among the stock on hand.

Ideally, a customer's order would at once trigger production of a product. The product would move through the various operations required to form it without any interruptions. Shipment would follow on the heels of the final operation. In any plant manufacturing by lots, this is indeed an idealized picture. Typically, the paperwork and preliminaries required to get an order into production will consume days, weeks or even months. Production will proceed intermittently, with varying amounts of delay time during and between operations. Shipment may or may not take place immediately. We are mainly interested in the delays which arise once everything required to process the order is available, and which stretch the actual manufacturing time.

The study of a plant's manufacturing interval directs attention toward the whole complex of production and avoids the more normal functionalized forms of analysis. It is aimed at discovering why a certain number of days or weeks is required to produce a product.

Beyond its usefulness as a convenient vehicle for an over-all production study, the manufacturing interval is an extremely important thing in itself for any firm. In the first place, this interval is usually a major portion of the lead time which exists between demand for an article and its shipment from the firm. The length of the lead time is an important factor in the cost and complexity of a company's planning and control systems. The longer the lead time, the more erratic the "hunting" oscillations of the firm's production are likely to be as they exceed and come under required levels of output. Long lead times complicate the problems of forecasting and inventory control.

Work-in-process Inventories are Basic Operation

The amount of material tied up in work-in-process inventories varies directly with the length of the manufacturing interval. These inventories may account for a sizable portion of the company's total working capital and, in manufacturing operations which have considerable process depth, may represent more value than all the other inventories and uses of working capital put together.

The length of the manufacturing interval, through its effect on manufactur-

ing inventories, has a marked effect on the production floor space required. Industrial floor space is growing to be a large element in cost. This is due, of course, to the rising standards of industrial working conditions in terms of heat, ventilation, noise level, lighting and general elbow room. Reducing the firm's manufacturing interval is, therefore, likely to play an important role in making better buildings and working conditions possible at lower cost.

While studies of the manufacturing interval often turn up unexpected factors, they usually lead to the discovery of problems and opportunities for improvement in two main areas, production management and production engineering. Some of the issues involved in reducing the manufacturing interval through improvements in these areas may be illustrated, in a general way, through a few examples.

Many Problems Found in Production Management

Investigation of the manufacturing interval may uncover problems in any area of production management. Those most frequently encountered, however, center in planning and forecasting, inventory control, production control or quality control. Many specific examples can be cited to show how each of these areas can cause delays in manufacturing. These examples merely illustrate the kind of situations which may exist. The important point is not the particular illustration chosen but the fact that several of these problems may exist in different areas at the same time; the most fundamental may be the least obvious.

Although much of the work of production management may be done in offices, its effects on the manufacturing interval are best noted out in the shop itself. This pile of material, that idle machine, those confused lots, all raise the question, "Why?" or "What has caused this?"

Large in-process inventories, cluttering the shop and hampering operations, can stem from many different causes. This problem, in one firm, was the result of releasing to production, lots which were much too large. Boxes of parts sat ahead of and behind one operation after another, while the whole lot moved slowly through the plant. The quantities involved were well above the minimum for economic runs. Reduction in lot sizes reduced the amount of material on the floor and left sub-lots in raw stores until capacity was available to move them quickly through the process centers involved. In another plant, the same situation resulted from ineffective dispatching and follow-up. Orders frequently remained for some time in a department after work on them was completed, and the control system did not readily bring this fact to light. In a third company, rejected items awaiting rework accounted for a great deal of the in-process inventory. Further study showed that the gauges used by the operators were often inaccurate. An improved gauge control program helped remedy the condition.

Bad Production Management Often Lengthens Interval

A long manufacturing interval is sometimes the result of excessive down time and poor utilization of equipment. In addition to the obvious technical problems of improper maintenance or faulty tooling, many functions of production management can contribute to this condition. A control system which does not insure timely deliveries of materials, tools and instructions to the machine can cause idleness. A system in which machine loading is performed haphazardly will do the same; this is particularly true where sequences of colors, similar set-ups and alternative processes must be considered. Improper control of rush orders may keep machines idle with frequent broken set-ups. In one case, a system of order priorities worked to put 30% of all manufacturing orders as written and 75% to 80% of all orders actually in the shop, in a "rush" category. The resulting confusion lost hundreds of hours of production at a time when maximum production was sorely needed to clean out a backlog. An area as far removed from the production floor as that of forecasting sales, inventories and production requirements can be an important contributing factor to machine idleness. Idleness caused by lack of work, by confusion of orders and by frequent changes of requirements, in one company, pointed directly back to neglect of the planning and forecasting function. While a study of the situation did not result in the discovery of a "crystal ball," more effective correlation and use of information that was available made distinct improvement possible.

Our discussion of the production management aspects of the manufacturing interval should have served to indicate that a major source of delay and a major source of control expense is due to interdepartmental movement of materials. The first step toward reduction of the manufacturing interval through production engineering is usually a study of shop organization in an effort to find ways to develop some departments which have product as well as process depth. A traditional shop organization in a firm, with varying production rates and any substantial investment in equipment, is a departmental or "job-shop" layout. This type of layout, with departmental groupings arranged by process, has many advantages. It keeps certain types of skills conglomerating within one supervisory area. It permits the development of supervision which is highly proficient within a given technical processing field. It is possible, through extensive use of centralized planning, to obtain very high machine utilization in process centers even though many different products and job orders are being worked on at the same time.

A study of shop organization from the standpoint of the manufacturing interval is likely to reveal that some changes may be made to develop departments which, while still primarily process oriented, have some product depth. This will reduce the number of interdepartmental moves and substitute intradepartment moves which may be made on a rather informal basis without centralized planning. The development of inexpensive, portable machinery to replace heavy fixed installations sometimes makes possible drastic revisions in shop organization. In one firm, the use of portable degreasers made possible cleaning and degreasing operations in the departments where the material was being machined, and eliminated an interdepartmental move to a separate degreasing area.

Layout Changes Can Bring Real Economies

Manufacturing interval studies can also direct attention to the layout of men and equipment within departments. In one firm it was found that a major portion of the floor space was occupied by tote boxes full of material ahead of and after completion of operations by individual machines. Since the department possessed considerable process depth, it performed four or five operations on a given lot. Study of the processing sequences revealed that it was possible to develop "product villages,"

or groups of machines, each working in sequence on a product. Materials were moved from one machine to the next in small trays, or even individually, so that the elapsed time of products going through the department was greatly reduced. In this instance, the machines were still scheduled as units, and production planning still operated on the assumption that the department was entirely process-centered. Nevertheless, the change in layout permitted real economies in the manufacturing interval.

Line production is a desideratum in manufacturing interval reduction. Some of the aspects of this straight line or "product controlled layout" production are much misunderstood, however, especially when manufacturing operations involving machinery are considered. Line production fabrication does not, as a rule, decrease direct manufacturing cost. It tends instead to increase direct costs, since it usually results in poor use of skilled personnel and poorer machine utilization than would be the case in a process-centered layout. Machines themselves do not perform their operations any faster merely because they are placed in a line. Rather, the line must proceed at the rate of the slowest machine. There may be considerable downtime as a result of the dependence of one machine upon another. It is difficult to balance production lines which involve machines because the operations are not divisible. Machine tools sometimes show amazing differences in rates of output; even when volume is high enough to permit balancing through having groups of machines feeding single machines or larger groups, the per cent utilization may be very poor.

Production Line Savings Are Difficult to Measure

Savings from the use of production lines for fabrication come largely from reduced indirect costs through easier production control, lower manufacturing inventories, less floor space and simpler dispatching and materials handling. However, these savings are likely to be hard to prove; the costs of lower output per machine and per worker are easily calculable whereas savings in floor space, savings in materials handling expenses and savings in control expenses are harder to forecast accurately.

In assembly work or work in which the human being is the controlling factor, line production is much more easily understood and usually involves larger savings. In this case, the line production device promotes the use of job specialization and the breakdown of one job into several smaller jobs. Large direct labor savings may result. This is the reason that the line production device is more common in assembly work than in fabricating operations.

Machine Utilization Basic to Interval Reduction

The problem of machine utilization is generally the key to manufacturing interval reduction, through the use of line production. In one firm the production volume of some of the firm's smaller products was so great, compared to the rest of the firm's production, that the burden of proof definitely rested upon doing other than separating this manufacture from the rest of the plant and establishing a production line to make these products. Study of the separation proposal showed that, while line production was feasible for much of the process, several of the critical operations would have to be performed on very expensive machinery which would be able to get out one month's production in something like 35 to 45 hours running time. A production line for these products, with heavy machinery committed to less than 25% utilization, was of course not possible. The firm was forced to continue its departmentalized layouts, although some product villages were employed to reduce the number of intradepartment moves. In another company, on the other hand, the production volume of just one item was sufficiently great to justify the complete separation of this product from the rest of the plant. Although some inexpensive types of machinery, such as drill presses, were not used continuously, a balance was obtained which produced excellent operator utilization and reduced the manufacturing interval sharply. A product passed through this small production line in two days while it took up to two months to get a similar article through the jobbing part of the plant. Major production control savings were also realized. The line production unit eventually produced about 25% of the firm's products with little control beyond a weekly schedule of output.

Changes in processing sequence and changes in actual processing techniques are a final avenue toward reducing the manufacturing interval through production engineering. In one case it was found possible to substitute a slow speed machine for a high speed semi-automatic one, in a planned production line. Tooling was simpler and operating costs were no higher because the line was forced, in any event, to operate at the speed of other, slower machines. The development of portable, compact heat and surface-treating devices, such as induction heaters and flame hardeners, has made it possible to install processes of this nature in machining departments to eliminate interdepartmental moves. In one firm a major source of delay and pile-ups of material was found to be the return of articles, after three stages of machining, to the foundry for tumblasting. This treatment was supposedly necessary to improve the appearance of the product. Once the importance of eliminating these interdepartmental moves was realized, a study was made to find alternative methods of surface treatment of the products to improve their appearance. This eventually resulted in a better looking product at even less cost.

Our discussion has stressed the importance of the manufacturing interval as an indicator of the effectiveness of a firm's production system and as a technique of analysis. Reduction of the manufacturing interval may lead to improvements in required lead times, in-process inventories, machine utilization and requirements for production floor space. As it directs attention toward the whole complex of production management and production engineering functions, a manufacturing interval study avoids many of the pitfalls inherent in more functionalized investigations.

Integration of Systems is Increasingly Necessary

Concern for the over-all systems, rather than strict attention to its parts, has grown steadily in many fields besides production. In laying out military aircraft, for example, it is no longer possible to design airframes, engines and control mechanisms, more or less, independent of one another. Instead, it has become increasingly clear that the total dynamics of the plane and its mission must be the basis for all designs.

Modern manufacturing, too, has developed into a closely interrelated complex of functions. No one functional approach can even describe its workings. While the results of a manufacturing interval study cannot be predicted, a better understanding of the dynamics of the plant as a whole is assured. END

The Facts About Human Engineering: An Important New Management Technique

by John D. Vandenberg

In the past ten years the term "human engineering" has been applied to a new area of psychological endeavor. This area of work is still so new that it not only lacks definition of boundaries but many psychologists are relatively unfamiliar with what their fellows are attempting to do. This paper has, therefore, both an historical and definitive purpose. It traces briefly the history of human engineering and presents a definition which seems appropriate to its preferred, current usage

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THE term human engineering has been used in three different contexts; (a) in counseling and selection, (b) in industrial relations, and (c) in man-machine relations. Since the phrase is being used most extensively in the latter sense, a major portion of this paper will be devoted to a consideration of its application to this area, and only brief mention will be made of its use in connection with counseling and selection and industrial relations.

In 1928, O'Connor (19, 20) used the term human engineering in connection with counseling and selection work. Both his *Born That Way* and *Psychometrics* contain expressions of his philosophy, but neither presents a direct discussion of his definition of the term. We may, however, make several deductions concerning the meaning he attached to the term.

O'Connor conceived his approach to the problem of analyzing human performance in industrial occupations as analogous to that of the mechanic or engineer who tears down and reassembles a complex piece of machinery in an attempt to understand better the workings of the complete mechanism by an examination of the component parts. He felt that proficiency on a job could be attributed to a number of aptitudes possessed by an individual. Different combinations of aptitudes might, he reasoned, account for an individual's satisfactory or unsatisfactory performance in a specific job.

In his *Psychometrics* he was considering the familiar thesis that technological improvements have developed far ahead of man's ability to make good use of these advances. It had been argued that this cultural lag existed because the ineffective performance of humans in the working world was retarding the rate at which these technological achievements were being absorbed into industrial systems. A possible explanation for this, O'Connor contends, was that while those in control of industrial plants know a great deal about technology, they really know very little about human beings.

O'Connor may have intended the term human engineering to be used to describe the following situation. As natural raw materials are "engineered" to suit a given purpose in a machine or structure, so too might humans be "engineered" to suit a given purpose in terms of capabilities and limitations (imposed by combinations of aptitudes) to fit into a particular job and thus facilitate the operation of industrial enterprises.

A second interpretation which O'Connor may have attached to the phrase is simply that the research methods of the engineer (isolating variables affecting a given operation) may be applied in understanding how individuals perform their tasks in industrial and business situations.

With the apparent exception of O'Connor, persons working on problems of test construction and personnel selection have been content to identify themselves with the general field of psychology and acknowledge their interests in specific areas. For some reason they have not emphasized the common philosophy they share with engineers and have not identified their work with a catch phrase as O'Connor has done.

Although O'Connor has been active for many years in the area of test construction and personnel selection as director of the Human Engineering Laboratory, his writings, and those of his associates, have not received wide distribution. Probably because his work has not been made available for professional comment nor given wide publicity

in the non-technical fields the term "human engineering," as O'Connor uses it, has not achieved general popularity.

Magoun (16), in 1932, was also concerned with society's failure to make maximum use of its technological advances. He proposed to increase industrial efficiency through improving human relationships. As a step toward such improvement he suggested that ". . . the student attack his problems exactly as he attacks his engineering problems: to develop a vigorous, unemotional, penetrating analysis of human relationships which will make for intelligent, robust living." (16, p. ix.)

Magoun chose to identify this attitude toward industrial relations with the term "human engineering" and although he gave no formal definition of the term, the sense in which he used it should be clear from the above excerpt of his *Problems in Human Engineering*.

Human Engineering in the Industrial Relations Field

An article by Henry Ford II (13) indicates that he has, either consciously or unconsciously, adopted Magoun's point of view. In an article appearing in ADVANCED MANAGEMENT, he was concerned with reducing costs through more efficient mass production and felt that such efficiency could be achieved if the problem of human relations in industrial production were improved. The following quotation from his paper is strikingly similar in tone to Magoun's remark as quoted above. ". . . I am sure that workable solutions to the problem of better industrial relations can be found if we will only bring to it the same insistent objectivity and willingness to experiment which you* and others like you throughout industry have given to the mechanical difficulties in mass production." (13, p. 50.)

An article in FORTUNE (24) reports that since 1945 the Ford Motor Company has had in effect an industrial relations program which adheres to the principles of objectivity in human relations. The article points out, however, that the program has not been particularly successful in reducing friction between labor and management and ". . . some personnel men now believe that the chill implications in these words alone may well have impeded Ford's efforts to win its employee's confidence."

Although the meaning which Magoun attached to the term human engineering has survived to the present day.

A man-machine relationship may be defined as a relationship in which a human being utilizes a machine to accomplish a given end. A man-machine system consists of a number of men and machines working to common goal.

The Man-Machine Relationship in Human Engineering

The first organized attempts to increase the efficiency of man-machine relationships seem to have been made in the 1880's by Taylor (with his development of time study) and by the Gilbreths (with their development of motion study) (1). These techniques involved the systematic observation of the workers' movements and permitted the researchers to prescribe optimal work habits and machine design to increase output. Until recently, activities of this nature have been identified exclusively with the field of industrial engineering.

The importance of optimizing the operations of man-machine systems was emphasized during World War II when military activities made liberal use of such equipment as radar, sonar, visual range finders, optical gunsights, and so forth. In many cases, the effectiveness of this equipment depended directly and in large part on the skill of the operator.

It was discovered frequently that equipment of this type did not yield the performance of which it was capable in strictly engineering terms. Investigations seeking the cause revealed that in some cases, particularly acute visual or auditory perception was required by the operator, in others, poorly-designed visual displays precipitated reading errors. In still others, controls were awkward to manipulate. For these reasons, many pieces of equipment could be operated by a relatively small percentage of the total number of available operators.

Since selection and training were costly procedures (in terms of both time and money), it was decided to redesign the equipment to accommodate a larger proportion of the operator population. Naval line officers attached the name human engineering to this procedure of adapting machinery to suit the operator's capacities. The presssing need at this time for effective machine design and redesign provided the impetus for the recognition of human engineering as a maturing, distinct, applied psychological science.

In time, the term human engineering came to be used to identify work being done on equipment arrangement, the suitability of the working environment (in terms of lighting, ventilation, seating, etc.) and the design of machine controls. Dunlap (7) points out that the term is now being applied to studies of optimal work stations, the physical and interpersonal environment, and to any set of conditions which may affect the productive capacity of men and machines as a working unit.

This broad application of the term is unfortunate since, as Mead (17) suggests, it will lose much of its value if it is applied indiscriminately to all attempts to fit the individual into his social and economic as well as his mechanical environment. He suggests that, in our use of the term, we ". . . confine ourselves, therefore, to that area of scientific endeavor which seeks an optimal rapprochement between the individual and the mechanized tasks which he is required to perform in our society." (17, p. 1127.)

In discussing the relationship between human and industrial engineering, Dunlap (7) states that ". . . There is a very distinct difference in emphasis between the approach of the time and motion engineer and the human engineer. The time and motion engineer has traditionally considered the machine a constant and the man a variable. . . . While the time and motion engineer has given attention to the redesign of equipment, this activity has been peripheral to the main trend of his endeavors.

"While the activities of the human and industrial engineer overlap to a degree, their major interests diverge along two lines. The primary interest of the industrial engineer has been on the machine, or in the arrangement of machines to insure an optimal flow of materials being processed. . . . The most serious limitation of the industrial engineer in the field of human engineering, however, is the lack of an experimentally verified literature which could be applied to human problems in industry. . . . The difference in approach, then, between the industrial and the human engineer is one of degree, one of emphasis on men rather than machines, and in the development of a useful experimental literature." (7, p. 320.)

Human Engineering is a Psychological Science

It is this emphasis that justifies the classification of human engineering as a psychological science even though much of the work and many of the methods

*The paper was originally delivered as an address before the Society of Automotive Engineers, Detroit, Michigan, January 9, 1946.

have previously been identified with other fields.

From this discussion it may be noted that the task of the human engineer falls into three general areas; 1. The design of human tasks, 2. The design of machines in terms of human capabilities and limitations, 3. The development of knowledge which will facilitate (1) and (2) above.

Mead (17) prefaced his discussion of human engineering with the assertion that, while some might consider the matter of definition hair-splitting, the recognition and delineation of the field which should result from a precise definition is essential to its success. Although a clear definition of the term as applied to this field may not be *essential* to its success, it should do at least two things: 1. Correct certain misconceptions that may exist concerning its sphere of activity; 2. Bring to the attention of administrators who are responsible for the performance of man-machine systems, the fact that techniques and knowledge are being developed which should aid in the solution of certain problems.

The Many Definitions of the Term Human Engineering

Let us consider, then, several definitions of human engineering that have been advanced by workers in the field and attempt to determine the extent to which the definitions adequately describe these activities.

Mead states that "Human engineering is that endeavor which seeks to match human beings with modern machines so that their combined output will be comfortable, safe, and more efficient." (17, p. 126.) It is felt that this definition may be misleading as well as excessively restrictive. The word "matching" implies that the primary function of human engineering is to select personnel who will operate certain machinery expeditiously. Selection actually plays a minor part in the work of the human engineer. Indeed, it may actually play no part at all and simply be the proper sphere of the personnel psychologist.

Wylie, in the foreword to *Lectures on Men and Machines*, has suggested that ". . . human engineering is the application of human factors to engineering design." (3, p. v.) Morgan, in the preface to the same work, considers human engineering to be the ". . . engineering of machines for human use and of engineering human tasks for operating machines." (3, p. vii.)

It seems that, if the term human engineering in Wylie's definition is restricted to the application of human factors to engineering design, it is merely being used to describe an additional type of data (that pertaining to human performance) which the design engineer must consider in his planning. Although an essential part of the human engineer's work involves making recommendations for machine design, an equally if not more important part of his work concerns the development of data pertinent to engineering design. Acceptance of Wylie's definition would exclude developmental and exploratory activity which is an integral part of the field.

Synthesis of Definitions Allows Final Conclusion

We would probably be correct in stating that Wylie's definition does not comprehensively define the work of the human engineer. It does, however, express succinctly and quite correctly a part of the philosophy underlying the work of human engineering, namely, the redesign of equipment in terms of human capabilities and limitations.

Morgan's definition, although broader than Wylie's, also appears to be too restrictive. This definition also overlooks that aspect of human engineering which develops useful data and methodologies and it should be modified before it can become useful.

A fourth definition has been advanced by Dunlap (7) who states that "Biomechanics is the application of scientific principles and data to the articulation of men and machines in order to enhance their efficiency and the job satisfaction of the operator."

The first portion of Dunlap's definition is open to the same objections that have been made to Morgan's and Wylie's definitions; it deals only with the application of principles and data to the articulation of men and machines and ignores developmental work.

The reference to job satisfaction implies that the human engineer is concerned with problems of morale and personal adjustment. It is quite likely that the individuals doing human engineering work would also take job satisfaction into account, but a consideration of this area does not occupy a large portion of their time. Although such problems should be dealt with in conjunction with human engineering work, their consideration is generally conceived to lie in the field of personnel psychology.

Let us consider, then, the following definition of human engineering. It follows closely those given by Morgan and Dunlap but attempts to include the research and developmental activities which they exclude:

A term "human engineering" may be used to identify those activities which develop and apply scientific principles and data to the articulation of men and machines in order to enhance the efficient operation of the system.

This definition suggests that the aim of human engineering is to affect the efficient operation of a man-machine system and that three areas of activity are engaged in to accomplish this task. These areas, to repeat an earlier statement, are; 1. The design of human tasks, 2. The design of machines in terms of human capabilities and limitations, 3. The development of knowledge which will facilitate (1) and (2) above.

No attempt has been made here to describe and illustrate human engineering problems nor to consider useful methodologies and sources of data. This task has already been adequately accomplished by authors Channell and Tolcott, Chapanis, Garner and Morgan, (3, 4), Dunlap, (5—10), Fitts, (11, 12), Mead. (17) and many others (14, 15, 22, 23, 24, 25).

Human engineering does not exist in a vacuum; it is related both to operations research and systems analysis. Since an exposition of these relationships is too lengthy to present here, readers interested in obtaining fuller information on these subjects may consult *Methods of Operations Research* by Morse and Kimball, (18), and *Systems research with special reference to human engineering* by Yarnold, (21). END

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Authors In This Issue . . .

LT. GENERAL RAYMOND S. McLAIN, USA, Ret., as former Comptroller of the the Army, has gained wide experience in control in one of the largest and best known organizations of modern times. His long and varied career includes experience in real estate, investments and banking as a civilian; his military duties have ranged from serving with the National Guard on the Mexican Border, to Infantry duty in the Mediterranean Theater; Field Artillery duty in England and as XIX Corps Commander in the battles of France, Roer, Rhine, Elbe and Germany. His post-war duties have been primarily with the Information Services of the War Department, and the Department of the Army. General McLain was appointed Comptroller of the Army in 1949. His study of the application of management principles to comptrollership appears on page 5.

W. EDWARDS DEMING, whose discussion of the use of statistical techniques in industry appears on page 8 is Professor of Statistics at New York University. He is the author of numerous articles in the fields of atomic physics and statistical sampling and application theory. Professor Deming has served as statistician and sampling consultant on several governmental missions in the Middle and Far East. In this country he has held teaching posts in three universities and has worked in the Department of Agriculture, and the Bureau of Census. Professor Deming was awarded his Doctorate in 1928 at Yale University. Japanese industry honored Dr. Deming by naming their annual award after him.

WILSON T. SENEY is a consultant in management controls with McKinsey & Company, gained his early business experience with Container Corp. of America, Marshall Field, and Hall Bros., Inc. He was controller and an officer of Univis Lens Co. before returning to consulting in 1950. He has taught at Dartmouth, and is a member of the Controllers Institute of America and the National Association of Cost Accountants. Mr. Seney's article, "What American Management Can Learn From Visiting European Executive Groups," appears on page 13.

DONALD H. SUNDERLIN, author of the article on lowering of toolroom costs (page 19) is a managing partner of the Sunderlin Organization, Management Engineers. After graduating from the University of Rochester as a mechanical engineer Mr. Sunderlin worked as a field engineer with the C. L. Stevens Company, and Rath and Strong, Incorporated, in Boston. He was in industrial engineering for four years prior to forming his own consultant firm of management engineers. The toolroom according to the author is the last and largest outpost resisting the management controls which are operational in all other production departments.

W. VAN ALLAN CLARK, JR., and WILLIAM E. RITCHIE, authors of the article on the dynamics of the manufacturing interval which appears for the second time in ADVANCED MANAGEMENT on page 22 of this issue, were at the time they wrote the article, Assistant Professors of Industrial Management at Massachusetts Institute of Technology. Professor Clark is a member of the Boston, Massachusetts, Chapter of The Society for the Advancement of Management, as well as the American Materials Handling Society.

JOHN D. VANDENBERG, whose article on the value of human engineering as a management aid appears on page 25, is on the staff of the Assistant Chief of Mechanical Development at the Picatinny Arsenal, Dover, New Jersey. Mr. Vandenberg's staff duties are establishing and maintaining a human engineering program which advises management concerning the human engineering problems encountered in munitions handling. Specifically, the program will advise as to the design of ammunition and packaging in relation to its transportation, storage, and use. In his former position as a Research Associate with Dunlap and Associates Mr. Vandenberg did a great deal of work on military projects which ranged from the abstract fields of information to the concrete problems of equipment design and placement.

NOVEMBER CHAPTER ACTIVITIES

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Atlanta	Management Philosophy As A Basis For Management Improvement	J. B. Joynt	Manager, Administrative Engineering Dept., American Enka Corp.	Atlanta Athletic Club	13
Baltimore	Sales—The Key To Production	John O. Logan	Vice President, Mathieson Chemical Co.	Stafford Hotel	3
Birmingham	Systems of Material Control and Distribution in The Armed Forces	Lt. Col. Einar H. Steelnack, Jr.	Instructor in Logistics, Air University	Molton Hotel	10
Boston	Panel Discussion on What Is the Quality Control Job	Dr. Joseph Juran Warren Purcell Richard Cotter Frank G. Fales	 Rath & Strong Speidel Corp. Sylvania Electric Products, Inc.	University Club	5
Charlotte	Government	Hon. Charles Raper Jonas		Barringer Hotel	17
Chicago	The Role of Operating Supervision in a Successful Wage Incentive Program	James E. Newsome G. C. Eggleston	Supt., Johnson & Johnson Chief Industrial Engr., Johns-Manville Corp.		10
	What Do Employees Think?			Furniture Mart	24
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	Plant Tour—Personal Products Corporation	E. G. Matz	Personal Products Corp.		24
	Industrial Engineering Problems	N. J. Nickl	Allen B. Wrisley Co.	Clearing Club	25
Columbus	Forecasting Sales For Better Management	Joy Misenhimer	Manager, Planning, American Can Co.	Ft. Hayes Hotel	19
Dallas	Staff Organization	Dr. William R. Spriegel	Dean, School of Bus. Admin., University of Texas	Melrose Hotel	11
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Detroit	Managing for Tomorrow	Dr. C. W. Walton	Gen. Mgr., Adhesives & Casting Div., Minn. Mining and Mfg. Co.	Rackham Educational Memorial	3
Fox Valley	Administration of Standards and Their Use As Control Devices in the Managing of a Factory	Charles E. Heitman	Group Executive, Charge of Frame Div., A. O. Smith Corporation	Elk's Club, Appleton, Wisc.	12
Greensboro	General Company Personnel Functions	Wendell Patton	Bruce Payne Associates	Starmount Country Club	17
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	Personnel Relations—Trends and Costs of Fringe Benefits	Curtis L. Collison	General Aniline Co.	Hendrick Hudson Hotel	19
Indianapolis	Productivity Through Teamwork	W. Paul Jones	President, Servel, Inc.		11
Kansas City	Annual Industrial Engineering Conference Theme—Time Standards Without a Stopwatch			Hotel Bellerive	20
Knoxville	The Pastor Counselor In Industry	Rev. Clifford H. Peace	R. J. Reynolds Tobacco Co.	Holston Hills Country Club	12
Lancaster	Human Relations Do Work	Harrison Dunning	Vice President, Scott Paper Co.	Hotel Brunswick	17
Lehigh Valley	Development of Our Supervisory Personnel	Dr. Richard Hartmann	Dept. of Psychology, University of Penna.		10

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Madison	Effective Organization	Norman Mitchell	A. T. Kearney & Co.	Student Union, U. of Wisconsin	4
Manchester	Machine and Allied Products Industrial Machinery Replacement Formula	Horace H. Beaudet	Superintendent, Draper Corp.	Carpenter Hotel	4
Milwaukee	Are Executives Expendable?	Dr. H. A. Vonachen	Medical Dir., Caterpillar Tractor Co.	E. S. M. Building	12
Montreal	Should Management Consider Profit Sharing	H. V. Lush	President & General Manager, Supreme Aluminum Industries	Ritz-Carlton Hotel	11
Nashville	The Pastor Counselor In Industry	Rev. Clifford H. Peace	R. J. Reynolds Tobacco Co.	Andrew Jackson Hotel	11
	The Delegation of Authority	Tape Recording, USN Management Series		Andrew Jackson Hotel	24
New Haven	A Case Problem in Industrial Relations			American Brass Country Club, Naugatuck, Conn.	11
	Plant Location and Financing			Board Room, New Haven Chamber of Commerce	12
	Politics and Economy	A. A. Ribicoff	Ribicoff, Ribicoff and Kotkin	South Meriden House, Meriden	19
New York	Effectuating a Cost Reduction Program	Phil Carroll, Jr.			19
N. New Jersey	High Level Production Through Pride in Workmanship	Dr. Dwight J. Bradley	Eppley & Bradley	Essex House, Newark	12
Philadelphia	Clerical Cost Control	Paul B. Mulligan		Poor Richard Club	3
	Control of Maintenance Costs	H. Michael	E. F. Houghton & Co.	Exide Crescentville Plant Conference Room	5
	Method Improvements	D. J. Cantor		Atlantic Refining Co. 260 S. Broad Street	11
	Plant Visit—Budd Company, Hunting Park Plant	A. J. Waring	Lanston Monotype Machine Co.		17
Pittsburgh	Bringing Supervisors to Middle Management Positions	J. K. Walters	West Penn Power Co.	Webster Hall Hotel	19
Portland	Student Chapter Night	R. Donald Langmo		Pacific Power & Light Board Room, Public Service Bldg.	18
Providence	(Subject to be Announced)	Bruce Payne	Bruce Payne & Assoc.		5
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Richmond	More For You	Dan Rockford	Standard Oil Co., N. J.		24
St. Louis	Principles and Areas of Cost Control	L. G. Rowe	Retired Vice President, White-Rogers Co.		10
Trenton	Methods Improvement and Cost Control—Round Table				2, 9, 16 and 23
	How Profit Sharing Boosted Our Profits	Clarence Wimpfheimer	President, American Velvet Company	Hotel Hildebrecht	17
Twin City	Planning a Management	Ed Schleh		Napoleon's, St. Paul	12
Western Mass.	Boost Profits Through Inventory Control	H. F. Dickie	Mgr. Production Control, General Electric Co.	Ivy House, West Springfield, Mass.	19
Western North Carolina	Good Neighbors (Plant Visit and Dinner)	Dwight J. Thomson	Vice President, Champion Paper & Fibre Co.	Champion Paper & Fibre Co., Canton, N. C.	11
Wilkes-Barre	How To Sell Your Ideas	H. T. Hollowell, Jr.	Vice President, Standard Pressed Steel Company	Hazleton, Pa.	
Wilmington	The Application of Engineering Principles In Government	Senator Ralph Flanders	Senior Senator of Vermont	Hob Tea Room, Delaware Trust Bldg.	2
Worcester	Individual Incentive vs. Group Incentive	Kenneth Bevan	Factory Manager, Tyre Rubber Company	Hickory House	9
		Alexander Strong	Partner, Rath and Strong Company		
		Victor Davis	Plant Manager, John Bath & Company, Inc.		

CIPM Reports . . .

DEFINING the philosophy of the American free competitive system is a comparatively easy task. However, when one tries to explain the system's actual operation to foreign businessmen, with all the maze of corporate and organizational structure inherent in it, the job of explanation becomes extremely difficult.

With the wisdom of hindsight, CIPM is aware that an important aspect of the American business scene has not been adequately explained to management men abroad—namely, the vital importance, of management associations in fostering higher productivity and higher professional standards of management in the American business community.

To meet such a need, the Council was recently entrusted by the Foreign Operations Administration, Washington, with the direction of a group of thirty-seven foreign leaders of management and management associations in a study program of associations in this country. (CIPM Reports, AM, Oct. 53, p. 29). Representing eleven countries from Europe, Latin America, and Asia, the team spent over one month in an extensive first-hand study of management, trade, and other professional associations in New York, Detroit, Chicago, Cincinnati, and Washington.

The entire group visited the national headquarters of SAM at 74 Fifth Avenue, New York, during which time Bruce Payne, President; C. A. Slocum, Executive Director; and Vincent Flynn, Director of Research; discussed with them the history, functions, and services of the Society for Advancement of Management.

Although there are many aspects of association work which are common to nearly all American groups, at least four very special and unique features of SAM's organization and activities which particularly impressed the team, judging from subsequent reports and discussions by team members, were:

1) The chapter system of SAM which permits a most effective balance between grassroots activity in advancing the science and practice of management, and membership in the national organization which assures the necessary administration, services, and educational facilities for the Society membership as a whole.

2) The tangible successes and advances in the use of SAM's time study films — samples of which films the group was privileged to see.

3) The professional problem clinics conducted at SAM's conferences which afforded a half-hour of full consulting service to The Society's members.

4) The activities of SAM's Economic Director in stimulating in the chapters self-education and discussion on current subjects of vital interest and importance to American management.

Members of the team represented some of the most influential opinion-molders in the business, and even political, community of their respective countries. They included national presidents of Chambers of Commerce, productivity center directors, industry federation presidents, corporation executives and directors, management and trade association leaders, government officials, consultant engineers, university deans, engineers, lawyers, public utility administrators, and even trade union leaders.

Not all the aspects of American association work could be, nor necessarily should be, applied in foreign countries with such different social, political and moral structures as our own. However, the team has witnessed and realized in the phenomenon of American associations important factors which have made our society dynamic and free, unfettered in general by coercive governmental controls, stultifying cartel systems, business pessimism, and restrictive business practices.

Eight general observations of American management associations can probably be said to have created the greatest impact on this association-study team. They are:

1) The fact that American management associations are actually in the vanguard of devising, systematizing, and disseminating a scientific body of knowledge in the field of management.

2) The absence of any problem in obtaining enthusiasm and incentive among American management to join and participate in this endeavor.

3) The presence (even the strengthening!) of the competitive spirit within the framework of American associations —in fact, this spirit motivates increasing membership in the associations and is also largely self-generating because of the important functions and technical services offered by the associations.

4) The lack of governmental control of American associations, i.e., the fact that membership is voluntary and is not coerced except by private compulsion.

5) The fact that American associations are extremely functional and grow out of various economic needs and challenges—that they grow *naturally*, and if they sometimes overlap one another in functions, they only continue to exist as long as the members obtain practical benefits from membership.

6) The multiplicity of American associations which is itself a reflection of the competitive enterprise system among American business.

7) The absence of any reticence on the part of American business to exchange information within the associations on all the subjects which are included in the broad field of management.

8) The fact that management and professional associations in America have no political attachments—that they are, to borrow from Paul Hoffman, "neither right nor left . . . but responsible."

Members of the team expressed to the writer a conviction that many of these conditions are not only applicable abroad to a greater extent, but that many of these conditions are the absolute *sine qua non* for improving productivity anywhere in the world. The program of the visit theorized, explained, and illustrated these conditions by means of acquainting the representatives thoroughly with the operations of fourteen American associations. The choice was admirable, for American associations are themselves representative of the complete gamut of the American management psyche: its individualism together with its organizational structure, its professionalism together with its material rewards orientation, its competitive spirit together with its professional camaraderie, and its scientific spirit together with its artful talents.

ROBERT GLEASON

AM Labor-Relations Report . . .

What About The First Line Supervisor?

There is a growing feeling among industrial and business leaders that history is repeating itself. Everyone with whom I discuss this problem, regardless of location, has the same reaction and concern. The facts of the situation are there for everyone to see. There is mounting interest again in organization of foremen in the Detroit area. Since less than 10 per cent now belong to organizations as contrasted with about 15 per cent at the end of the war this development has possibilities. A recent report indicates that budgets for foreman training generally have been reduced by one-third in the past three years. This, while there is more attention than ever being given to that relatively undefined term "executive development." Foreman training apparently has not hit the target as far as the development of fundamental management skills are concerned. Other reports indicate that real earnings for foremen have fallen almost 20 per cent behind the pace set by the average wage earner in the past decade.

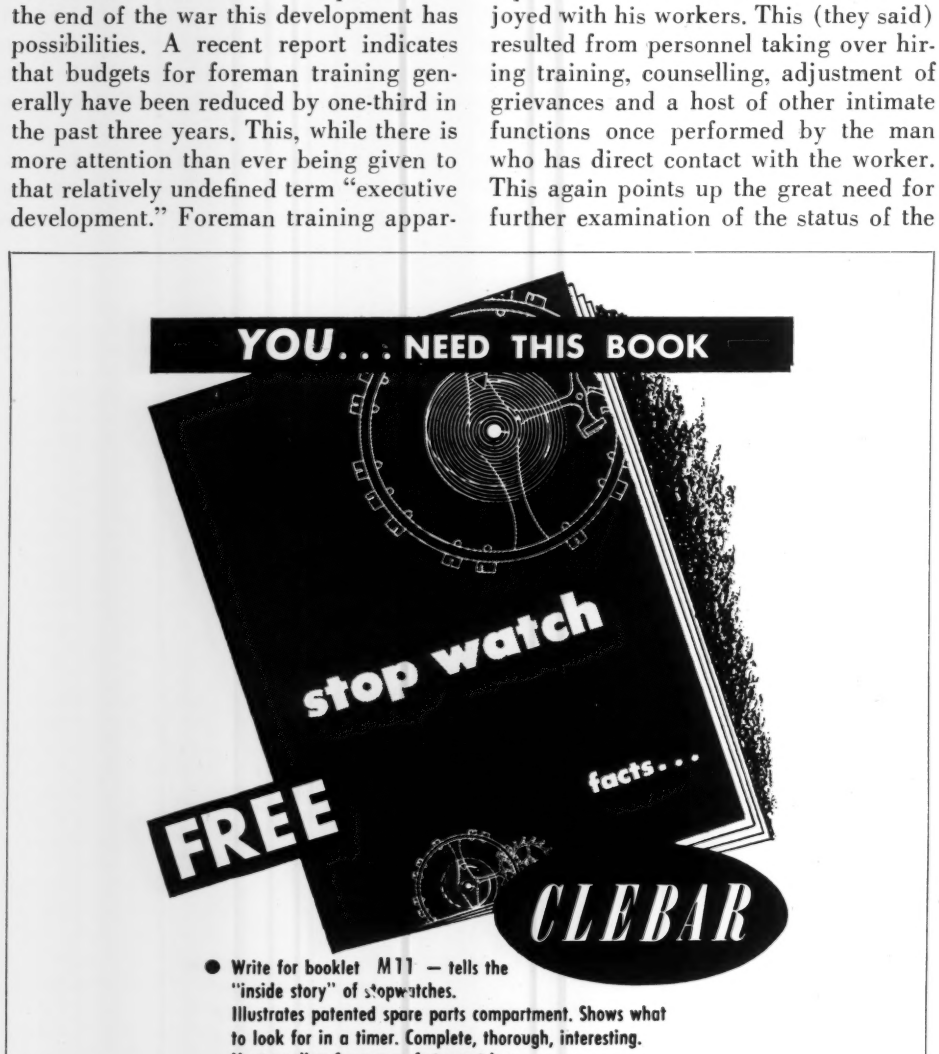
Perhaps the crowning touch is the one I discovered while discussing this matter recently with a group of Eastern executives. Some felt the growth of personnel departments in recent years had "robbed" this first line management representative of the status he once enjoyed with his workers. This (they said) resulted from personnel taking over hiring training, counselling, adjustment of grievances and a host of other intimate functions once performed by the man who has direct contact with the worker. This again points up the great need for further examination of the status of the foreman, and should cause some personnel executives to review their functions, to determine if they have in fact transgressed on intimate territory to the detriment of the full usefulness of the first line supervisor. The fault is sure to be found in a lack of definition of the function of the foreman rather than transgression by personnel.

There is another side to this problem, which also has its adherents. This point of view holds that the foreman has little time for the personnel function since he is burdened with the multiple responsibilities of cost control, production schedules, methods improvements, safety, quality problems, and many others. All of these, however, are the normal functions of the foreman as a manager in addition to his personnel responsibilities.

A frank and honest appraisal of the situation would undoubtedly conclude that most companies (not yours of course) have never, in fact, functionally made the first line supervisor a part of the management structure. Surveys indicate that little more than half of them actually feel that they are a part of management. We have obviously not found the answer in training alone, and if reports are accurate, even this is on the decline. The real answer to at least part of the problem seems to lie in something which we have known in other human pursuits for years.

There is no question that many industrial and business organizations are doing a good job in training. We all must know by this time, however, that training alone even on the target is not enough. Perhaps training has had too much emphasis as an end rather than as a means to an end. A good job in this area is, in fact, relatively useless without motivation and inspiration in the use of the skills that are learned. There is no better example of this than in the field of human relations. The motivation for the supervisor to create an integral unit of an organization, and through it to create production, must come from his superiors. It's time now to take another critical look at the effectiveness of your organization and your people. And even yourself.

LOWELL F. JOHNSON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AM Advertising Review . . .

SEVERAL years ago one of our largest correspondence schools released an advertising study covering a 32-year period. During this more than three decades they frequently placed in one weekly magazine an advertisement which offered to send to any interested student a catalog of any of their courses.

Almost without exception, 90 per cent of all the requests for information were received within a week of the publication of an advertisement. The remaining replies and enrollments came straggling in for seven years.

Those who advertise machinery, special services, equipment, metals, chemicals, and new products that are bought by manufacturers, contractors or retail stores, cannot expect to receive 90 per cent of their returns from a given offer in a week's time, yet some advertisers in the business paper field expect almost immediate returns from their advertising.

This happens often: A new product or service is offered in a paid advertisement. Nothing much happens. A few inquiries and orders trickle in. In the same issue that the advertisement appeared, one might find a special department with a heading, "Things New." Some manufacturers send a sample of their products to the editor who examines them and then writes a short, factual story about the items. Within a few weeks the editor receives many letters asking the name of the company and where they are located.

While business paper advertising is usually more informative than consumer goods advertising, such as soap, cigarettes, new mixes for the kitchen, and wearing apparel, one cannot help but believe that business paper advertisers still have something to learn about actual copy preparation, and the illustations they use when they advertise their own goods or services, and the "time factor" in buying.

Time factor in buying ranges from buying a package of gum on up to the decision to engage an engineering firm to erect a complete factory. In the case of a package of gum it's an almost instant decision. We see the gum, we want to change the taste in our mouth, we lay down a nickel, and that's all there is.

When a new plant is under consideration at least a hundred contractors and architects are alive to the situation. Add to this the list of thousands of suppliers of materials that go to make up the complete plant, and you have a long list of sellers.

Which of these sellers will eventually be told that their materials or services have been specified? How long will the buyer debate one product against another before he buys?

We have some information about heavy consumer goods buying. Several thousand home owners were interviewed. Four different items were analyzed: addition to the home, new heating plant, new refrigerator, and new insulation for the entire house.

On the average each of these new purchases were made after the head of the house and his wife had spent 18 months shopping, checking, and studying the offers made by some salesman.

Advertising "Pulls" in Business Papers

Advertising in any business paper pulls, it does not jerk. Once the advertiser understands the time factor in buying, once he has analyzed a hundred orders and learned first-hand how long the prospect studied and analyzed an offer before buying, then, and only then, will he be convinced that his advertising should be run continuously.

We have enough evidence now to prove that the advertiser will obtain larger net returns if he concentrates in one publication at a time. It's a safer investment to buy 6 magazines each month for a full year than 12 magazines that are used only 6-times a year.

ADVANCED MANAGEMENT is one of the most completely and carefully read business publications in this country. Its Research Service Department is now, and will continue to be, always ready to assist any advertising agency and their clients who are interested in selling more of their goods or services to The Society's members.

FRANK E. FEHLMAN

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in handling your company's employee relations problems, do you prefer lengthy, legalistic analyses of labor laws and regulations? Learned citations of court cases? Profound interpretations of NLRB rulings? If that's what you want, you can get it from several excellent labor services.

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